Rock Products

ANNUAL ILLUSTRATED REVIEW AND DIRECTORY NUMBER

F. L. SMIDTH & CO.

225 BROADWAY — Engineers — NEW YORK, N. Y.

PROTECTED

AGAINST HIGH POWER COSTS

AGAINST HIGH MAINTENANCE COSTS

Write us describing your pumping conditions and we will send you the names of concerns using Hydroseal Pumps under similar conditions. Then, you can write them direct asking anything you want to know about the economies and performance of this unusual pump. If you prefer, send for our new thirty-six-page catalog No. 937, or if desired, one of our representatives (located in all principal cities) will call.

HYDROSEAL MAXIMIX RUBBER PROTECTED DREDGE PUMPS

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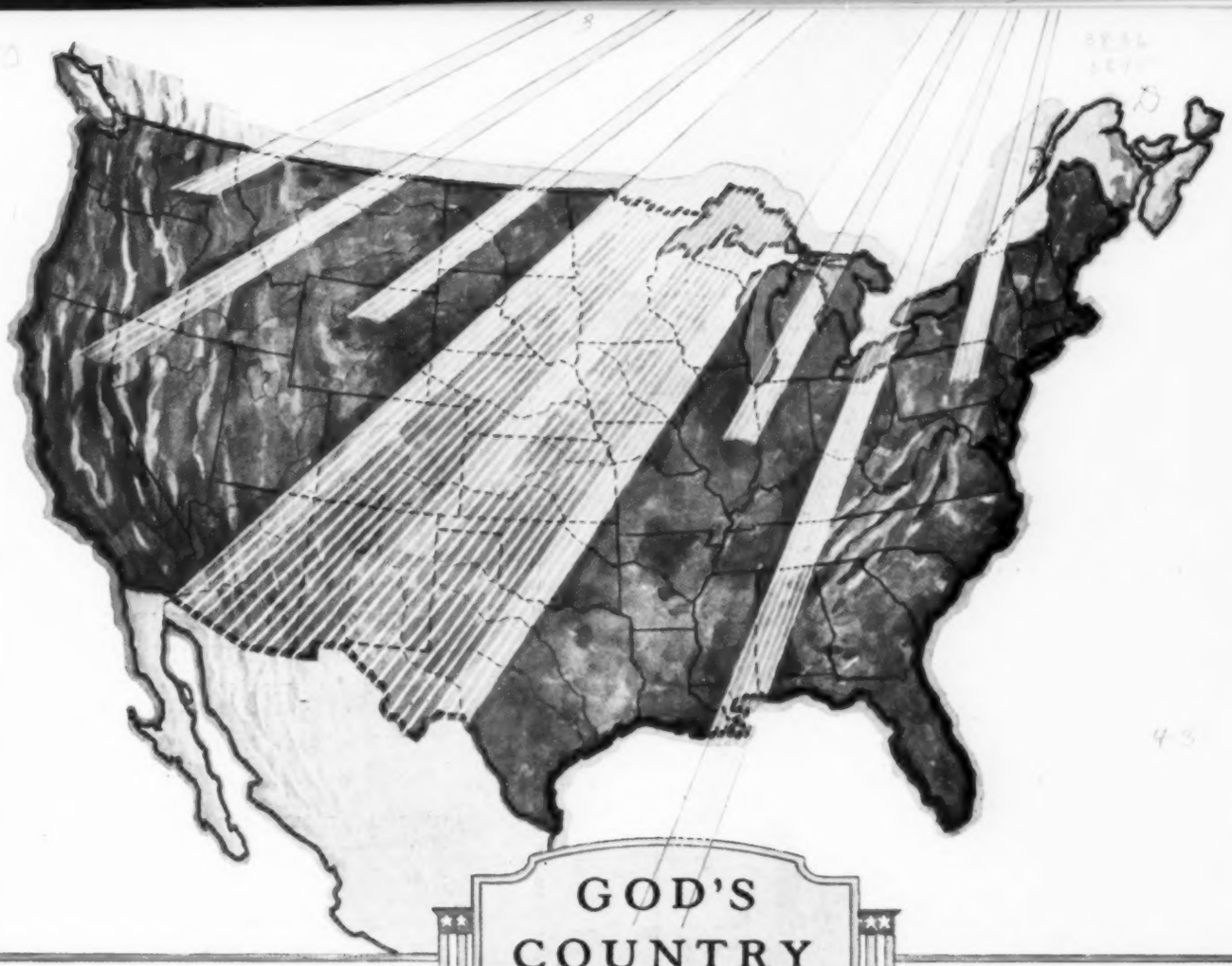

GOD'S COUNTRY

"Breathes there a man, with soul so dead,
Who never to himself hath said,
This is my own, my native land?"

—SCOTT

SURE we've taken it on the chin! Sure we've had our duststorms, droughts and depressions! So *what?* The gilt frame may have been broken, but the picture remains *unchanged.*

• • •

If you ever feel your knees getting a little shaky, try this simple experiment . . . repeat these words . . . *slowly:*

"Before the world, I AM AN AMERICAN! I envy no man. I fear no man. No man has anything I covet. No man can take away from me anything I have.

"Mine is a nation of *youth,* made out of a new kind of steel, alloyed with the blood strains of many peoples . . . not too stubborn to bend, but too strong ever to be broken.

"With its far-flung frontiers, mine is a land so broad, so rich in its hidden treasure, so vast in its resources that, if we had to, we could build a fence around ourselves and live forever . . . *alone.*

"Mine is a people of common stature, uncursed by class . . . vaccinated against all isms, cults and imported crack-pot philosophies . . . noisy at a ball game, but dangerously silent in battle.

"My people *think!* Over the roar of wheels, in thundering subways, in factory and field, in the depths of mines, amid the clank of tin dinner buckets, behind the drawn blinds of their thirty million homes, wherever they are, even now they are thinking . . . thinking out the answers that others cannot find. And, when the time comes, they speak . . . without stuttering.

"I am proud of American inventive genius; if there had never been *but just these few* Americans . . . Franklin, Fulton, Bell, Edison and the Wright Brothers . . . this would *still* be the greatest nation on earth.

"But most of all I give thanks for American Industry and for American business brains that have found a way to pay better wages . . . to work shorter hours . . . to pay more for their raw stuff . . . and still, with the help of mass production and mass distribution, give the people what they want *at prices they can pay.*"

• • •

So long as machinery continues to ease the strain on muscle, and Americans after a day's work aren't too tired to *play* . . . nothing really serious is going to happen to . . . GOD'S COUNTRY.

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The Leading Manufacturer of Equipment for Handling Materials and Transmitting Power

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Rock Products

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CEMENT and ENGINEERING NEWS CONCRETE PRODUCTS
Founded 1896 Est. 1918

RECOGNIZED THE WORLD OVER AS THE LEADER IN ITS FIELD

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Owned and Published by

TRADEPRESS PUBLISHING CORPORATION

PUBLICATION OFFICES
205 West Wacker Drive, Chicago, Ill.
Telephone—Central 0670

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Indexed in the Industrial Arts Index. Published Monthly. Subscription Price: United States and Possessions, Mexico, Cuba, Canada, $2.00; and $4.00 to foreign countries. Twenty-five cents for single copies.

To Subscribers—Date on envelope indicates issue with which your subscription expires. In writing to have address changed, give old as well as new address.

ROCK PRODUCTS
Bears the Twin Hall-Marks of Known Value

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Authentic facts relating to editorial scope and readership analysis

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IT FLOATS THROUGH THE HOSE WITH THE GREATEST OF EASE

A typical example of Goodrich improvement in rubber

UNLOADING a car of cement or any such bulk material used to require an expensive gang of laborers, who had to sweat and strain with heavy bags which cost money to make and fill, and more money to handle. A machinery manufacturer, searching for a more efficient way, invented a machine to do the work.

Propelled, under its own power, into a car of bulk material (no expensive bags necessary) this hungry little machine picks up cement on a revolving disk, passes it through a "pusher" screw into the hose. The cement isn't *blown* through with strong air currents; just enough air is drawn in to cushion each cement particle and let it float or be pushed along like a liquid.

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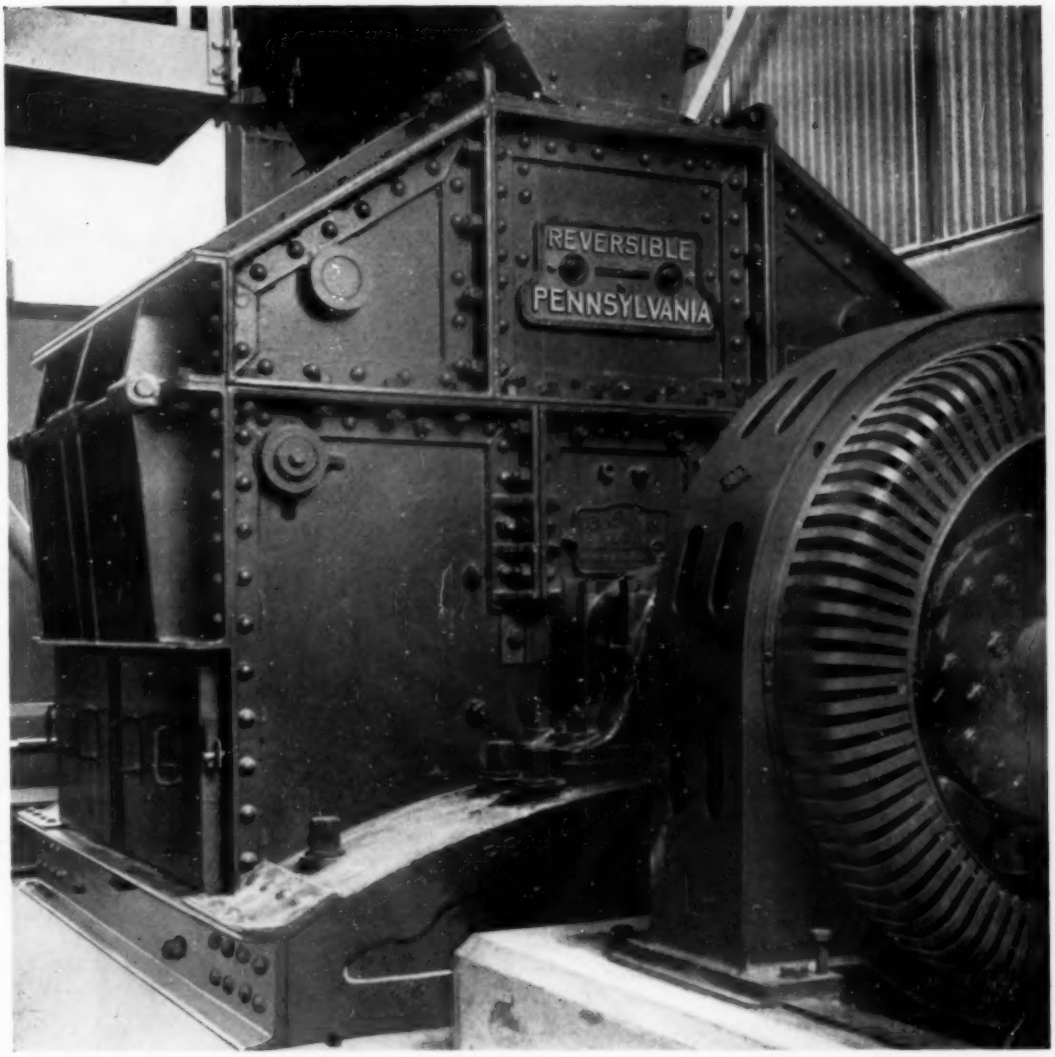

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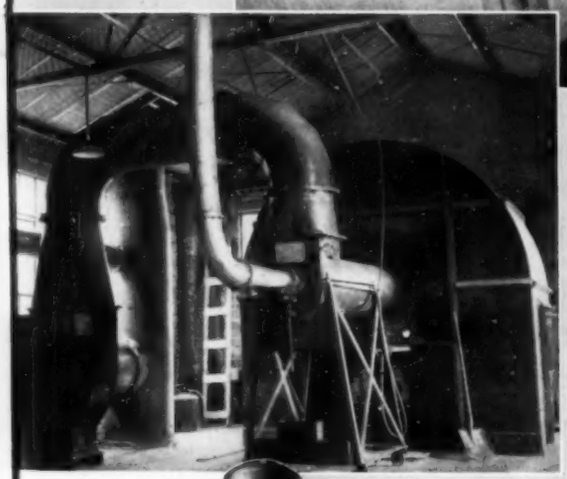

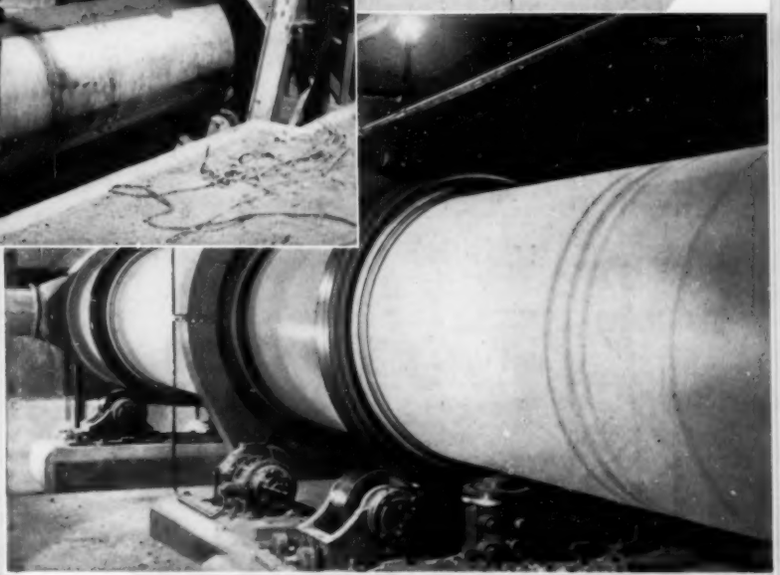

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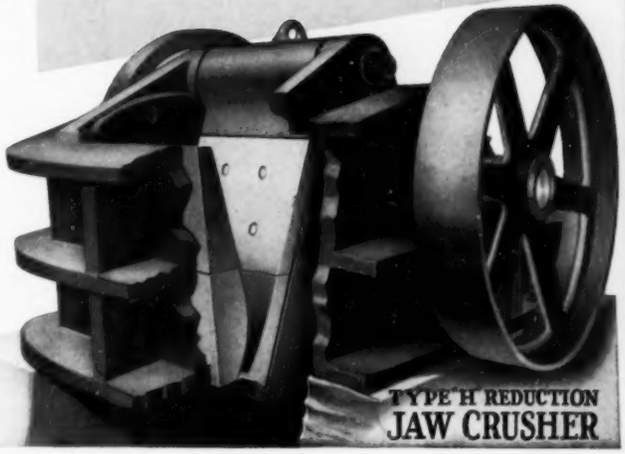

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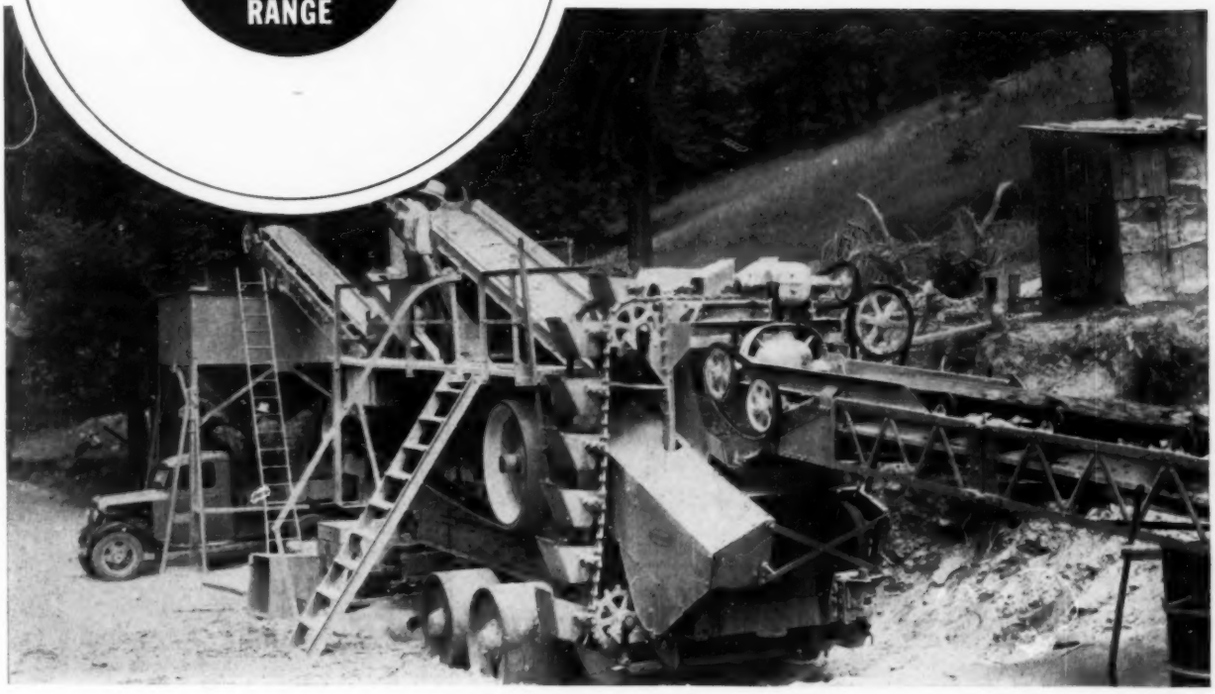

● 51,449,000 tons of gravel . . . 65% of the tonnage used on paving operations in 1936 . . . were produced by non-commercial crews, says the U. S. Bureau of Mines. Here's a rich field . . . ripe for cultivation by commercial producers equipped to compete beyond the economical hauling zone of a fixed plant.

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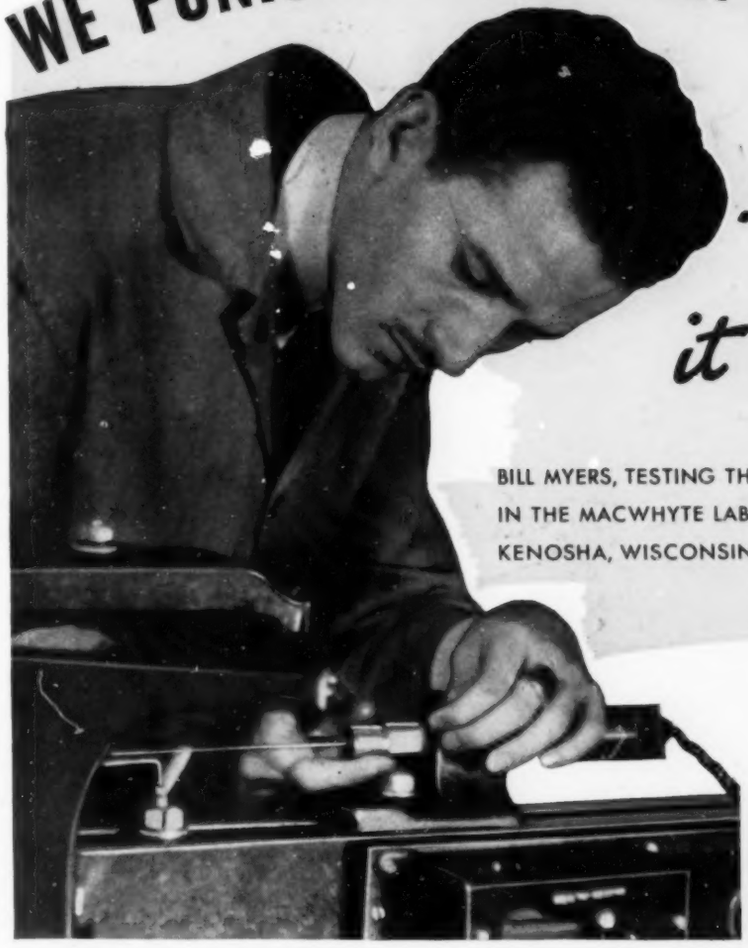

BILL MYERS, TESTING THE FATIGUE LIFE OF WIRE IN THE MACWHYTE LABORATORY, KENOSHA, WISCONSIN

"That sounds like a lot of punishment," says Bill Myers—Macwhyte Metallurgist—"but this Haigh Robertson Fatigue Testing Machine actually rotates the wire, and through this rotation, subjects the wire to bending stresses. These bending stresses are repeated 10,000,000 times without failure of the wire. Then we're sure the wire will really resist fatigue on your job.

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MACWHYTE WHYTE STRAND IS *BETTER* BECAUSE IT'S MADE BY SPECIALISTS

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THE WIRE ROPE WITH THE INTERNAL LUBRICATION

SELECTRO

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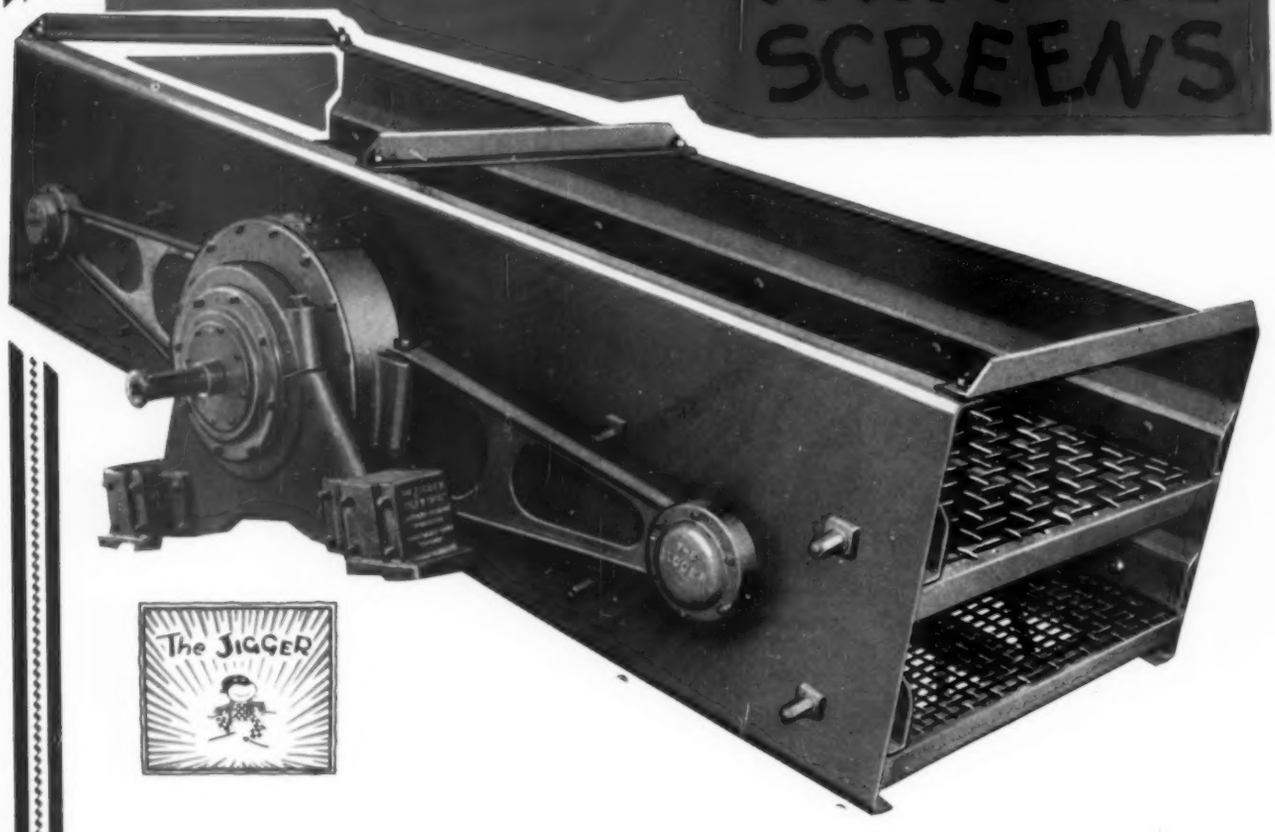

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Inc.

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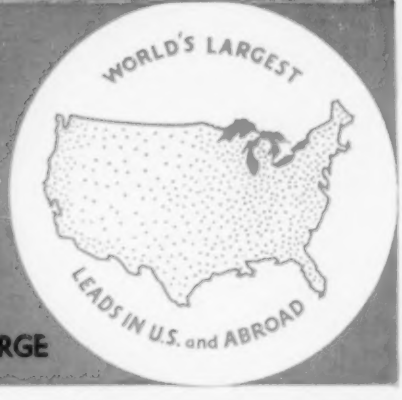
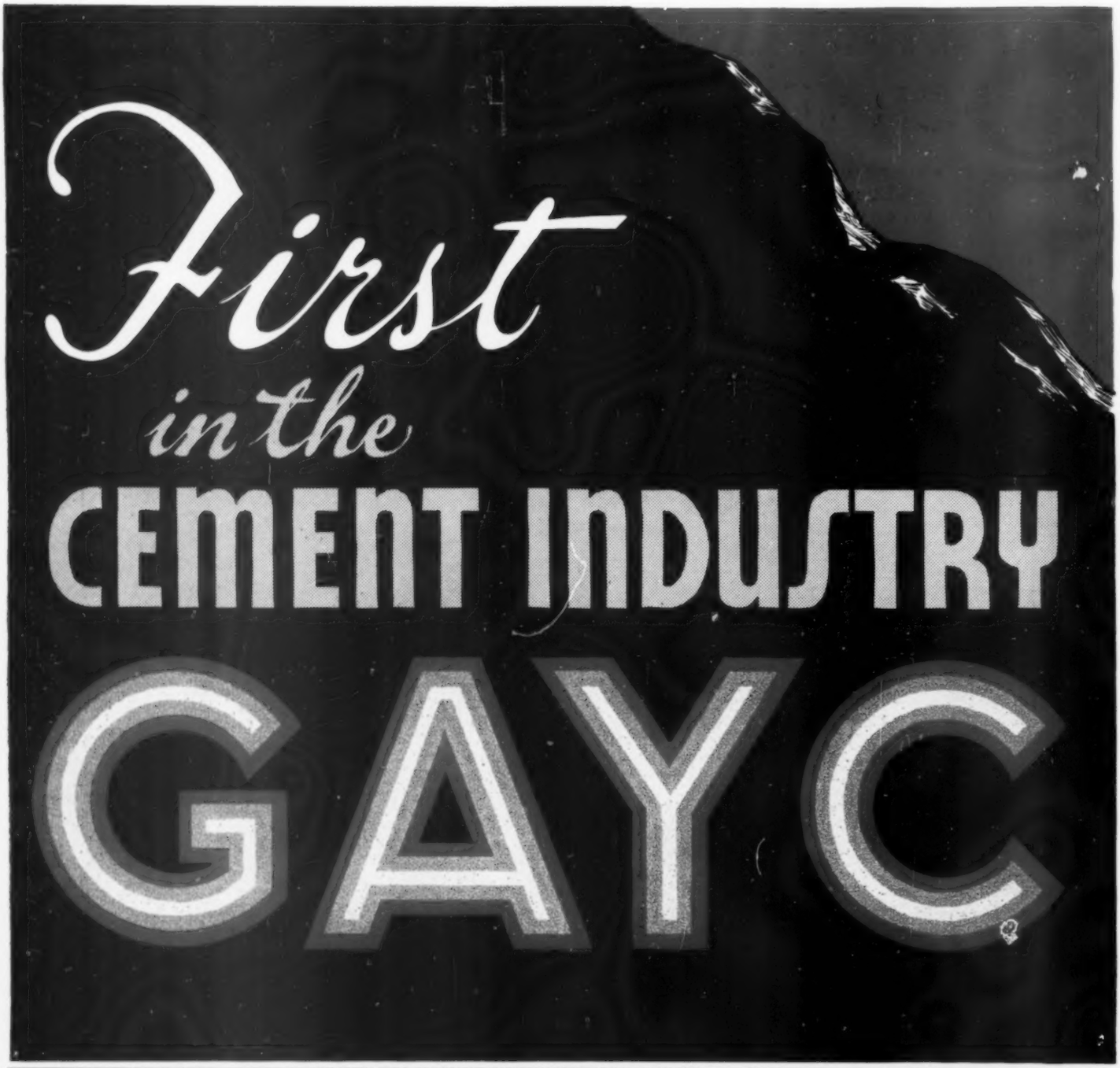
Haden Co., Houston, Tex.	Has Placed	10	Orders, for a Total of	22 Jaeger Units.
Howard Concrete Producing Co., Cincinnati, Ohio	Has Placed	10	Orders, for a Total of	21 Jaeger Units.
Keefner Concrete Co., Des Moines, Ia.	Has Placed	8	Orders, for a Total of	11 Jaeger Units.
Knoxville Sangravl Material Co., Knoxville, Tenn.	Has Placed	4	Orders, for a Total of	6 Jaeger Units.
Kuhlman Builders Supply & Brick Co., Toledo, Ohio	Has Placed	9	Orders, for a Total of	16 Jaeger Units.
P. W. Lambert & Co., Linden, N. J.	Has Placed	3	Orders, for a Total of	7 Jaeger Units.
Maloney Concrete Corp., Washington, D. C.	Has Placed	7	Orders, for a Total of	44 Jaeger Units.
J. & I. O'Rourke, Flushing, L. I.	Has Placed	6	Orders, for a Total of	28 Jaeger Units.
Richter Transfer Co., Cincinnati, Ohio	Has Placed	12	Orders, for a Total of	40 Jaeger Units.
Ryan Ready-Mix Concrete Co., Brooklyn, N. Y.	Has Placed	7	Orders, for a Total of	22 Jaeger Units.
H. L. Seabright Co., Wheeling, W. Va.	Has Placed	18	Orders, for a Total of	22 Jaeger Units.
Warner Co., Philadelphia, Pa.	Has Placed	8	Orders, for a Total of	22 Jaeger Units.

Jaeger Truck Mixers and Agitators give you a RECOGNIZED ADVANTAGE in selling ready-mixed — a stronger, more workable concrete, preferred by both engineers and contractors, produced by the most efficient, low cost mechanism ever developed for mixing and delivering concrete. Write for our Catalog. Its information is authoritative and complete. THE JAEGER MACHINE CO., 602 Dublin Avenue, Columbus, Ohio.



JAEGER TRUCK MIXERS

BUILT IN 1½-2-3-4-5-6 CU. YD. SIZES — END OR SIDE DISCHARGE



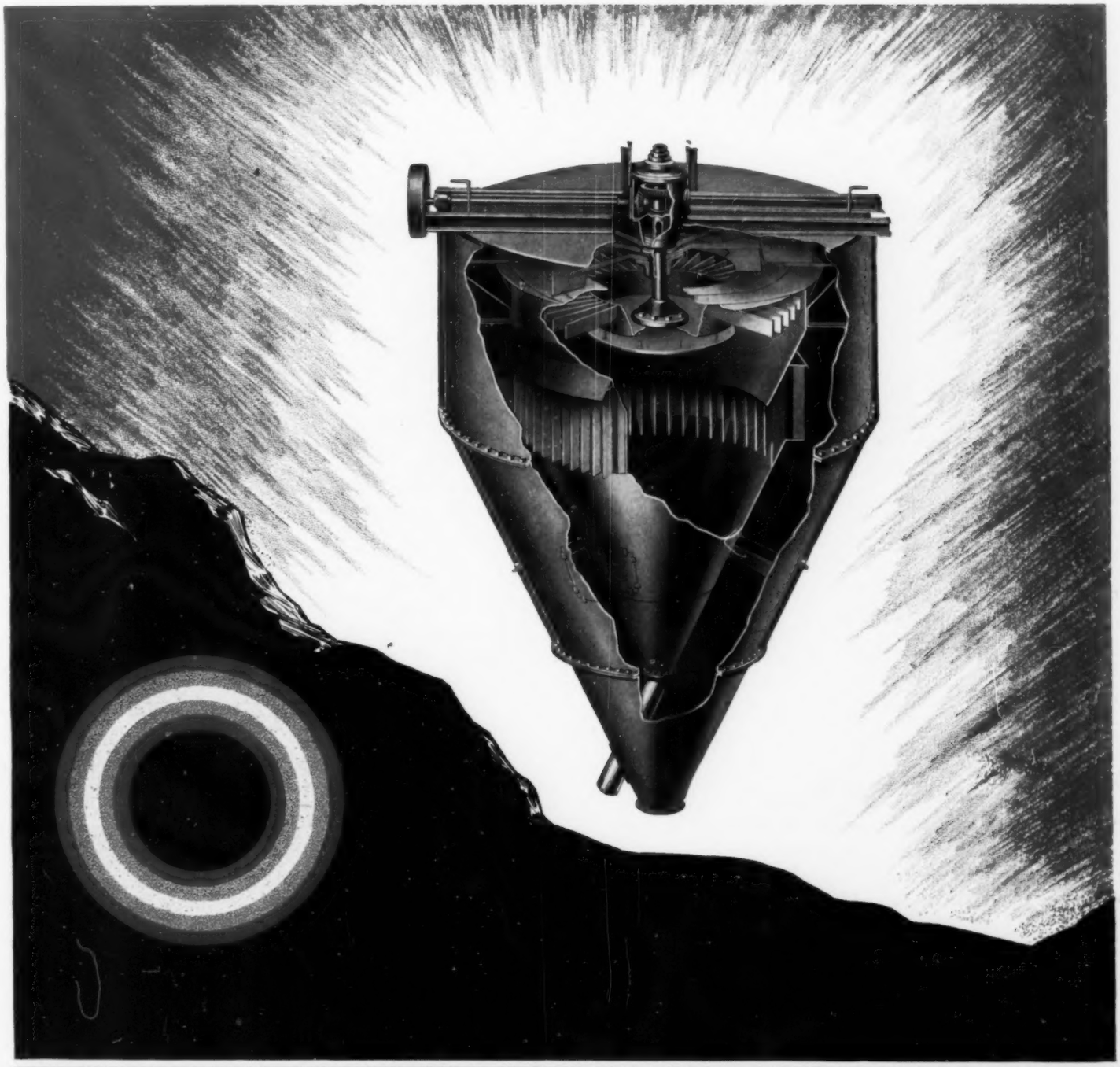
The first GAYCO AIR SEPARATOR revolutionized the cement industry by making possible a material separation previously considered impossible.

The present model GAYCO still leads the industry, representing the very latest improvements in separator design, insuring a more uniform product, greater capacity, cleaner tailings and higher efficiency than is possible with any other Air Separator. It is built to stand up under the most severe usage, and give maximum service with low maintenance cost.

Will separate practically all dry fine materials including many that are too sticky to be screened. Easily adjusted for any desired screen analysis from 60 to 400-mesh.

The principle of rejecting the coarse particles by means of Centrifugal sizing fan is an exclusive GAYCO patent.

Send for descriptive bulletin today.



Universal Road Machinery Co.

MAIN OFFICE
AND FACTORY
KINGSTON, N. Y.

LABORATORY
KINGSTON, N. Y.

GAYCO

RUBERT M. GAY - DIVISION
114 LIBERTY STREET
NEW YORK, N. Y., U. S. A.

GAYCO

"GAYCO" CENTRIFUGAL
SEPARATORS

"RELIANCE"
CRUSHING, SCREENING
AND
WASHING EQUIPMENT

Tough Rope for Tough Jobs

"Flex-Set" Preformed Yellow Strand is especially recommended for hoist line, crowd rope, rack rope and swinging lines on power shovels; for dragline and hoist line on dragline machines; for holding line and closing line on clam shell buckets.

Almost any wire rope will serve well enough in some places—but where the going is rough—*and tough*, there "Flex-Set" Preformed Yellow Strand shows its super-quality—its unquestioned ability to *"take it,"* and *"like it."*

This is the same Yellow Strand that has been "taking it" successfully for many years—the same specially drawn wire, tested and selected—the same careful manufacture by the same company that is now *62 years young*.

The difference results from preforming, which sets the strands to the helical form they maintain permanently in the finished rope. Thus "Flex-Set" Preformed Yellow Strand is largely pre-broken in. It is limp—easy to handle and install—highly resistant to kinking, fatigue and wear.

With these properties, how could it be other than economical? Try it!

BRODERICK & BASCOM ROPE CO., St. Louis

Branches: New York, Chicago, Seattle, Portland, Houston; Factories: St. Louis, Seattle, Peoria

U-9

"Flex-Set" Preformed YELLOW STRAND

THEW CENTER DRIVE

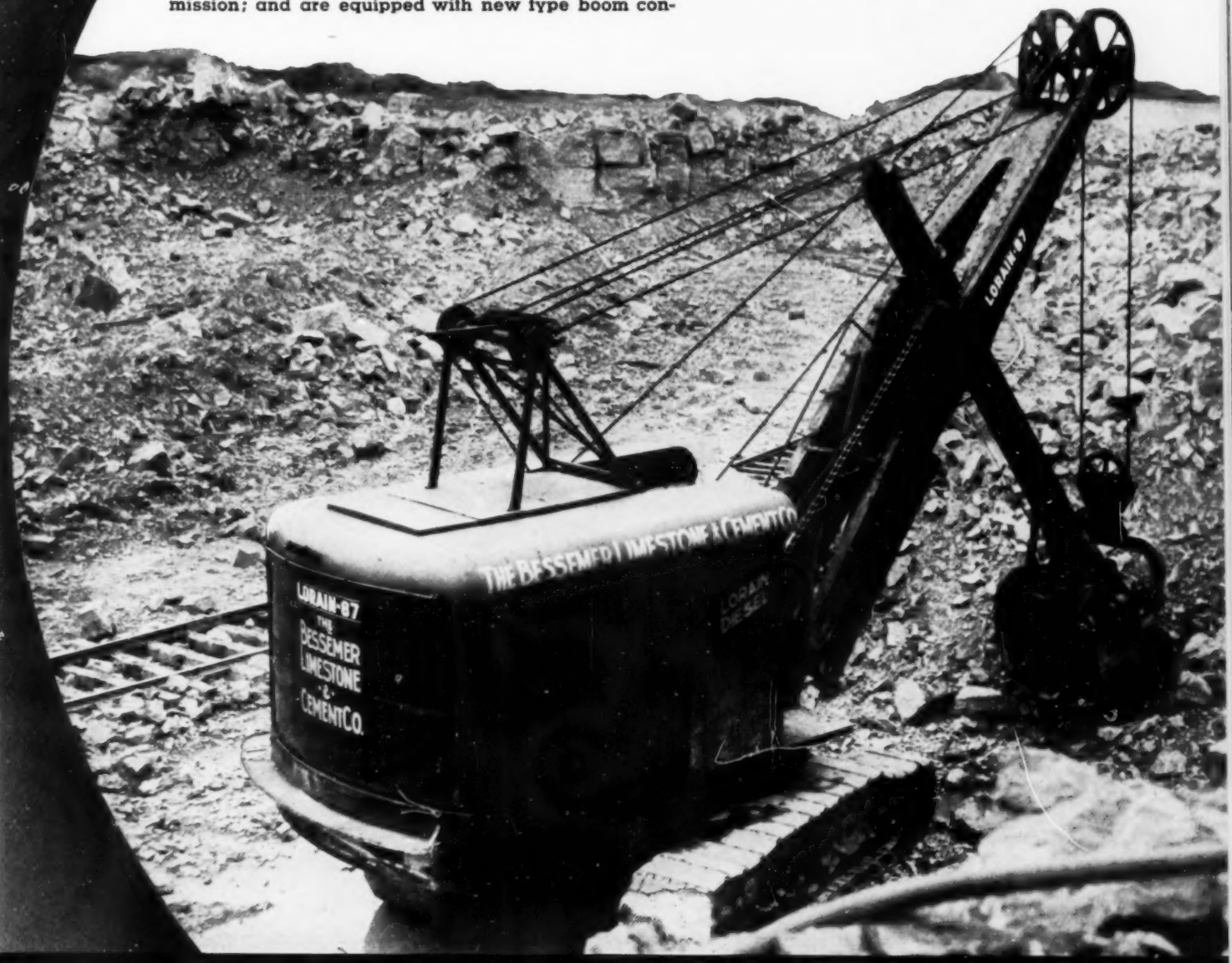
Rock-Worthy

● There are few shovels that thrive on an all-rock diet, but loading out 26-yd. cars of limestone to feed a 48-inch crusher is just so much meat to this Lorain-87 Diesel of the Bessemer Limestone & Cement Co., Bessemer, Pa.

There is always plenty of rock on tap at the crusher when Lorains are working in the pit, for here are shovels that can stand the gaff. They are rugged in construction; have direct high-efficiency power transmission; and are equipped with new type boom constructions which are designed accurately for torsion as well as bending and compression stresses.

If it's big production with economy that you are after, write today for catalogs describing Lorains. You will find them mighty revealing as to what real rock shovels have to offer.

THE THEW SHOVEL COMPANY • LORAIN, OHIO



LORAINS 3/8 to 2 YD.

AMERICAN

for GREATER TONNAGE AT LOWER COST

Over 25 years of experience in designing and manufacturing reduction equipment have resulted in this powerful crushing unit.

It is designed and built for long trouble-free service. Every part has been tested for quality, wear and endurance to assure absolute satisfaction in actual service. AMERICAN CRUSHERS can withstand terrific punishment and stay right on the job delivering more tonnage per hour and producing a better product.

Long life . . . low power . . . minimum upkeep cost all are assured by using only carefully selected and tested materials in all parts. SKF Spherical Roller Bearings, Cast Steel Adjustable Platten and Manganese Lined Crushing Chamber are standard features.

AMERICAN CRUSHERS produce a more uniform product . . . minimum fines and no slivers or chips.

Write for complete details.

AMERICAN PULVERIZER CO.

1245 MACKLIND AVENUE . . . ST. LOUIS, MO.

Building a faster drill is one thing—
Making it so that it will stand up is another

That's why Ingersoll-Rand pistons pass through 48 operations in their manufacture

These numbers on a piston enable us to determine the exact batch of steel from which it was made, as well as all of the pertinent details concerning the forging, machining, heat-treating, inspection and test of the part.

PIECE by piece the parts of a rock drill look simple and easy to make—but looks are deceiving. No other machine has to withstand the abuse of modern drills.

Consider the piston of the DA-35 drifter; one end operates at a freezing temperature, the other, frequently at 250° F. It must deliver heavy blows at the rate of about 2000 per minute (depending on conditions)—millions of these impacts during its lifetime. It receives 48 separate machining, testing and heat treating operations and is actually being worked on 55 hours in the course of its manufacture.

During the last thirty years there has been a tenfold increase in drilling speed—the life span of parts has been lengthened—dependability has grown progressively greater—upkeep costs have steadily decreased. Credit for this great improvement is due in a large measure to Ingersoll-Rand research and development.

REASONS WHY THE DA-35 PISTON STANDS-UP

1. Metallurgical specifications for each piston incorporate 60 years of accumulated experience.
2. No steel for any other purpose whatever, is selected as carefully as the material that goes in rock drill pistons. Composition is controlled with unbelievable accuracy. Each batch must pass a physical inspection, chemical analysis and an elaborate hardenability test before it leaves the mill.
3. Proper heat-treating is a highly technical operation. The handling of this step in the manufacture of I-R drills is entrusted only to specially trained metallurgists.
4. A correct design, highly skilled craftsmen and a thoroughly modern plant and equipment insure a superior product. Sizes are held to one-half of one-thousandth of an inch (.0005") variation.
5. Every finished piston is tested in a specially developed magnetic testing machine, which gives what we call "a mechanical X-ray", indicating the depth of hardness and the most minute variations from specified standards. Each lot of finished pistons is also given an actual running test on Barre granite.

I-R PRODUCTS

Aftercoolers	Compressors	Hoists	Refrigeration Units
Cameron Pumps	Condensers	Paving Breakers	Rock Drills
Blowers	Drill Steel & "Jackbits"	Pneumatic Tools	Rock Drill Accessories
"Calyx" Core Drills	Engines	Receivers, Air & Gas	Tie Tampers
			Vacuum Pumps

513-5

Ingersoll-Rand

11 BROADWAY, NEW YORK CITY

Atlanta Butte Denver Hartford Newark Pittsburgh Scranton Seattle

Scott St. Yard
Oct. 1934

Plymouth Rd. Yard
Jan. 1937

7 Mile Rd. Yard
Sept. 1937

3 PLANTS FOR KOENIG

Why Not Let

BUTLER

Help Solve Your

MIXING PLANT PROBLEMS

?

3 PLANTS FOR TEWS

North Ave. Yard
May 1934

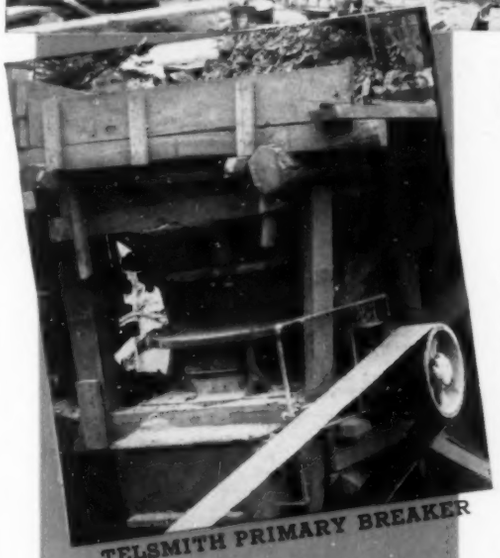
Morgan St. Yard
April 1936

West Allis Yard
July 1937

VISIT OUR EXHIBIT A14 AT CLEVELAND

SEE THE BUTLER BULK CEMENT PLANTS IN ACTUAL OPERATION

BUTLER BIN COMPANY « « WAUKESHA, WISCONSIN



TELSMITH PRIMARY BREAKER

TELSMITH GYRASPHERE

CRUSHED STONE *for Roads*

AT THE LOWEST COST PER TON

A well-known Southeastern contractor, E. W. Grannis of Fayetteville, N. C., had his troubles in crushing hard abrasive rock for road grading and surfacing jobs. Jaw crushers proved unsatisfactory for both coarse and secondary crushing—also very expensive to maintain. Rolls also proved inadequate. Along with other big operators, Grannis has solved his crushing problems by discarding jaw crushers for Telsmith gyratory breakers. For secondary crushing, roll crushers were replaced by Telsmith Gyraspheres — with distinctly better results.

Mr. Grannis had a 6½ mile road job at Mocksville, near Statesville, N. C. And it meant 50,000 tons of minus 1½ in.—crushing granite boulders and field stone. So he bought this complete Telsmith rock crushing plant—(A) No. 13B Telsmith Gyratory Crusher; (B) 32 ft. No. 6 Telsmith Belt Elevator; (C) 4 ft. x 10 ft. Telsmith double deck Pulsator Screen; (D) 16 in. x 22 ft. Telsmith Reject Conveyor; (E) No. 36 Telsmith Gyrasphere Crusher. The screen is mounted over a 25 cu. yd. bin. A 100 hp. Diesel powers the equipment.

This Telsmith plant has convincingly demonstrated its ability to produce stone for road grading and surfacing at the lowest possible cost per ton. And it has set a remarkable record for low maintenance. Whether you are planning a new plant or modernizing, *write for Bulletin E-11* describing Telsmith quarry and gravel pit equipment. GC-3-38

SMITH ENGINEERING WORKS
508 E. CAPITOL DRIVE MILWAUKEE, WIS.

Associates in Canada: Canadian Vickers, Limited
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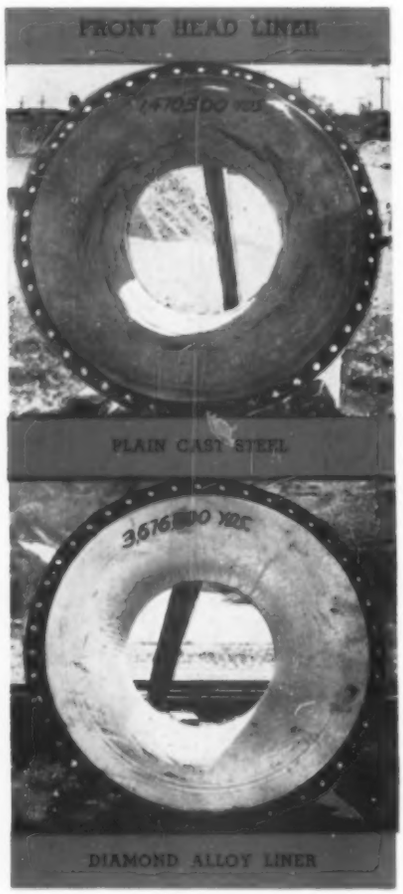
Pittsburgh, Pa.

Brandeis M. & S. Co.
Louisville, Ky.

TELSMITH



DIAMOND

ALLOY DREDGE PUMP LINERS

FRONT HEAD LINERS Fort Peck dredging equipment uses single-stage centrifugal dredge pumps. The original front head liners (upper left) made of plain cast steel, seldom lasted for more than one and one-half million cubic yards of pumping. The one pictured shows the liner completely eaten through and the front head severely attacked after producing 1,470,500 cubic yards. The new DIAMOND alloy liners lower left) have a Brinnell hardness of approximately 600, and a tensile strength of over 50,000 pounds square inch. The one pictured above (right) has produced 3,676,800 cubic yards and is still in good condition for further service.

BACK HEAD LINERS Fort Peck dredge and booster pumps were initially equipped with alloy steel plates for back head liners (upper right). These were good for no more than one and one-half million cubic yards of production. The new DIAMOND alloy liners pictured above (lower right) were scarcely touched after producing 1,418,900 cubic yards.

Now Liner Plates on Ft. Peck Dredge Pumps *last up to 8 times longer*

and handle millions more cubic yards

"Diamond alloy is a new metal used for dredge pump wearing parts and for other castings required to withstand severe abrasion and corrosion. Its record of service is outstanding. This is equally true of its record with the U. S. Engineer at Fort Peck, Montana, where the 28" dredge pump front and back head liners pictured above were used. DIAMOND alloy has outlasted other metals normally used in dredge pumps as much as eight to one. You, too, can expect exceptional life from its use.

"Diamond alloy liners can now be supplied for dredge pumps where the remainder of the pump is made of manganese steel. This combination gives correct application for both Diamond alloy and manganese steel. The manganese steel to absorb shock and abrasion on the shell and impeller and the Diamond alloy to withstand the abrasion on the liners.

"Pettibone Mulliken Corporation manufactures complete dredge pumps and such dredging equipment as cutters, cutter heads, flap valves and pipe fittings. Their engineers are available for your assistance in the design of complete dredges. DIAMOND dredge pumps are made in sizes from 4" up. The wearing parts are made of DIAMOND alloy or manganese steel, or the best alloy steel suited to the particular use to which the pumps are to be subjected."

STEAM RAILROAD TRACK WORK
ELECTRIC RAILWAY SPECIAL TRACK WORK
HEAVY MACHINE WORK
FORGINGS
DREDGING EQUIPMENT

Write for Particulars

MANGANESE STEEL CASTINGS
CARBON & ALLOY STEEL CASTINGS
HIGH TEST GREY IRON CASTINGS
ALLOYED IRON CASTINGS
DIAMOND DREDGE PUMPS

PETTIBONE MULLIKEN CORPORATION
GENERAL OFFICE & WORKS-4710 WEST DIVISION ST.-CHICAGO, ILL.

LIMA enters 1938 the pacemaker among shovels, draglines and cranes. Efficient, high speed operation of LIMA machines continue to smash yardage records everywhere. In quarries, brick plants, sand and gravel pits, coal and metal mines, lumber, general construction, etc., LIMA is giving the kind of service that users want—service that steps up production and delivers big yardage at low cost. Start the new year right with a LIMA shovel, dragline or crane on your job.

LIMA LOCOMOTIVE WORKS, INCORPORATED
SHOVEL AND CRANE DIVISION
LIMA, OHIO, U. S. A.

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Tyee Machinery Company, Ltd.
Vancouver, B. C.

NEWARK, N. J.
317 Frelinghuysen Avenue

SAN FRANCISCO
800 Bush Street

DALLAS
1304 McKinney Avenue

LOS ANGELES
2001 Santa Fe Ave.

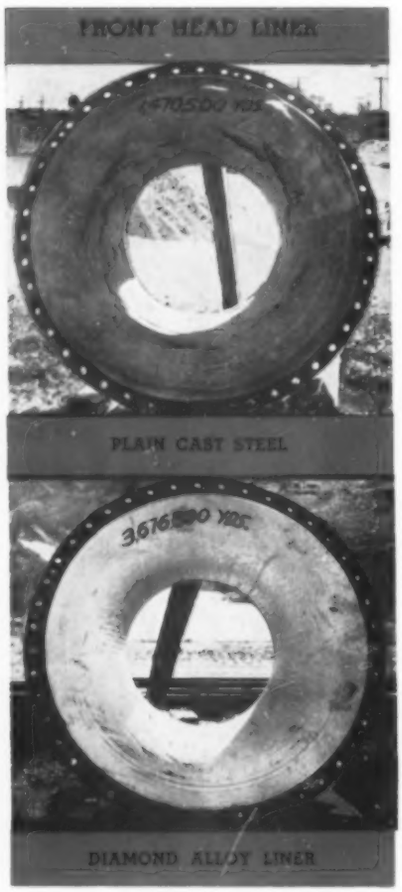
MEMPHIS
77 McCall Street

SEATTLE
1938 First Avenue South

The General Supply Co. of Canada, Ltd.
Ottawa, Ont.

Still Again in 1938

LIMA Convertible SHOVELS DRAGLINES and CRANES



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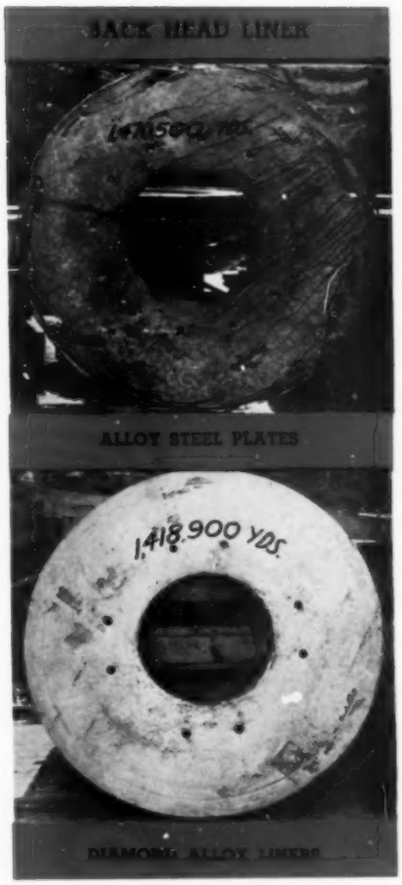

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ELECTRIC RAILWAY SPECIAL TRACK WORK
HEAVY MACHINE WORK
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Write for Particulars

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SHOVEL AND CRANE DIVISION
LIMA, OHIO, U. S. A.

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DALLAS 1304 McKinney Avenue
LOS ANGELES 8001 Santa Fe Ave.
MEMPHIS 77 McCall Street
SEATTLE 1932 First Avenue South
The General Supply Co. of Canada, Ltd. Ottawa, Ont.

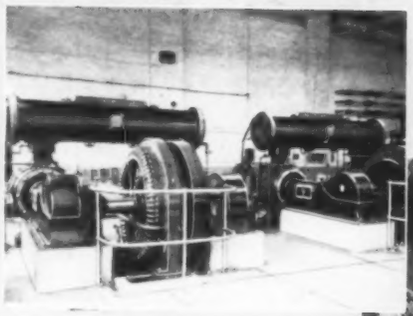
Still Again in 1938

LIMA Convertible SHOVELS DRAGLINES and CRANES

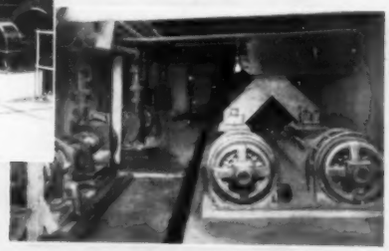
NORTH, SOUTH, EAST, WEST—
That G-E Equipment

If you are considering building a new plant or installing new equipment in your present one, call in our nearest representative now. He will study your electrical problems and show you how G-E equipment can be applied to fill your requirements exactly. General Electric, Schenectady, N. Y.

Notes Made On

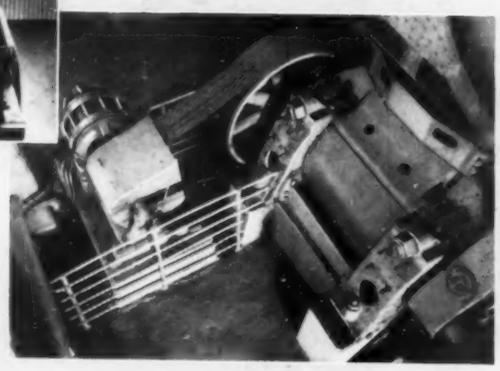


Two G-E 300-hp, 225-rpm synchronous motors driving air compressors in plant of Keystone Portland Cement Co., Bath, Pa.



G-E induction motors driving pumps at plant of Volunteer Portland Cement Company near Knoxville, Tenn.

G-E 40-hp induction motor driving belt conveyor in plant of Hudson River Stone Corp., Cold Spring, New York



G-E 200-hp wound-rotor motor operating rock crusher in plant of Nazareth Cement Co., Nazareth, Pa.

GENERAL

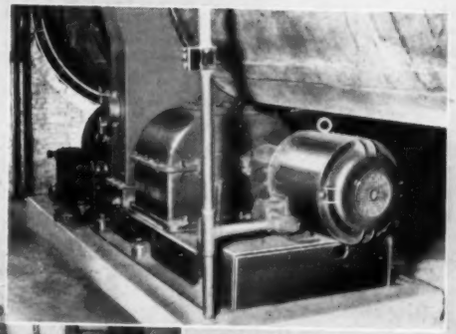
Filing No. 153

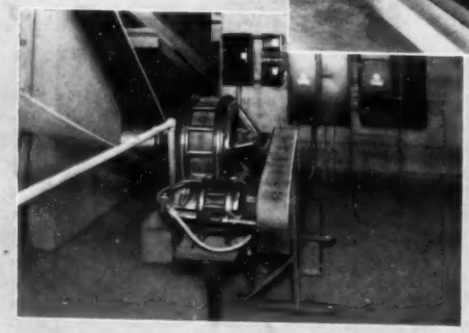
TRIPS TO MODERN PLANTS SHOW Helps the Rock-products Industry to Obtain

Plant Trips

G-E synchronous-motor controls, switchgear, and motor-generator sets in plant of Glens Falls Portland Cement Company, Glens Falls, N. Y.

G-E totally enclosed, fan-cooled, 20-hp, d-c motor driving rotary kiln through reduction gear in plant of Minnesota Mining and Manufacturing Co., Wausau, Wis.





G-E 50-hp, 900-rpm, wound-rotor induction motor driving a kiln, and G-E Selsyn transmitter for synchronizing speed of slurry feeder with kiln, in plant of Olympic Portland Cement Co., Bellingham, Wash.

1. Increased Plant Efficiency
2. Continuous Operation
3. Higher Return on Investment

HERE are pictures of General Electric equipment in some of the leading rock-products plants in this country. In each of these plants, G-E equipment is used extensively. It helps to make possible continuous operation, increased plant efficiency, and lower costs.

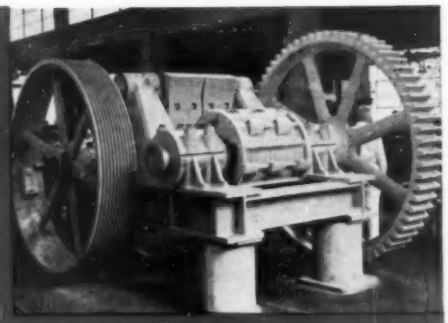
These plants are operated by progressive companies that recognize the aid given by modern machinery and up-to-date, properly applied electric equipment in obtaining a product uniformly high in quality and a higher return on the investment.

It is our plan to take you with us on trips through the plants of other such companies during the coming year, and to give you further evidence of the wide acceptance of G-E equipment by the rock-products industry.

E L E C T R I C

011-323

McLANAHAN



FOR OVER one hundred years this corporation has been specializing and developing machinery for the preparation and refining of raw materials from pit, mine and quarry.

This applies to the great limestone and sand and gravel industries as it does for iron ores, phosphate rock, gypsum, fluorspar, zinc, cement, gold and diamond bearing ores, coal, etc.

It is possible to show here only a few of the many types and sizes of machines built by McLanahan & Stone Corporation for use in the various industries throughout this country and abroad. The illustrations show the sturdy design of this equipment. Its efficiency, economy and superiority is instantly recognized wherever used.

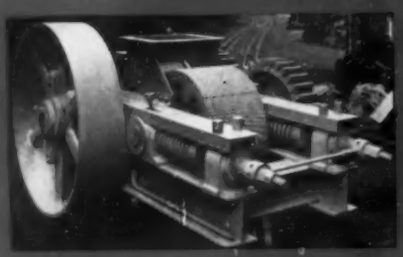
Study these ruggedly built machines and see how they would fit into your production plans—then write for literature and full details.

McLANAHAN & STONE CORP.

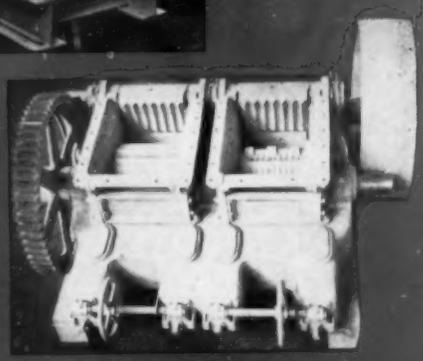
MANUFACTURERS—FOUNDERS
MACHINISTS

Continuously in Business Since 1835

Hollidaysburg Pennsylvania

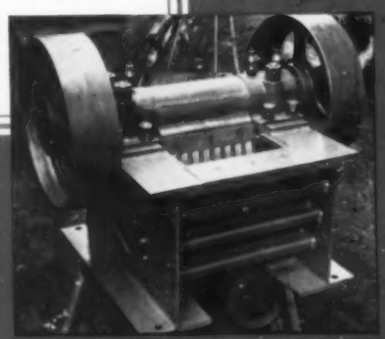


ABOVE—Giant All-Steel Primary CRUSHER, latest type for shovel-loaded limestone. Quick adjustment and automatic frame iron protection. Cover removed to show manganese segment roll, and interchangeable and reversible crushing plate liners. V-belt drive. Alemite lubrication.

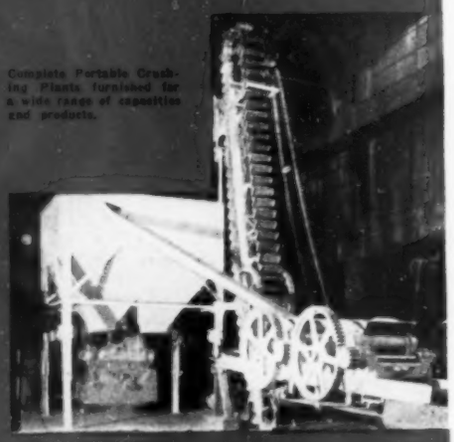


ABOVE — Double-Roll All-Steel Patented Segment-Roll Crusher. Steel gear guard and roll cover removed. Built in any size for various capacities.

RIGHT—Twin primary and secondary Quick Adjustment Steel-strut crushers in different sizes for portable and semi-portable plants. Two jobs well done with one drive.

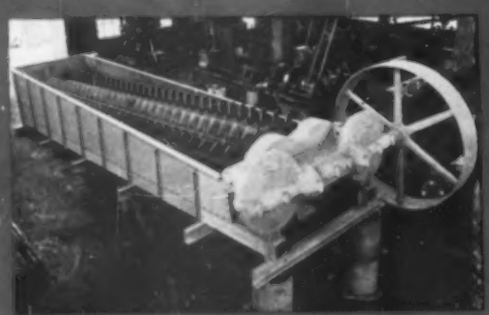


All-Steel adjustable force-feed and discharge Jaw Crusher adapted for use in portable, semi-portable and stationary plants.



Complete Portable Crushing Plants furnished for a wide range of composition and products.

Why use two or more machines when one will remove all of your tough clay, eliminate soft rock and other objectionable material. Save stripping costs, and hand picking by doing the job efficiently at a minimum of cost with McLanahan machinery. Open new markets, create new demands, rework your old waste dumps, condition materials which could not be used before. It is being done by other operators throughout the U. S. and can be done for you.



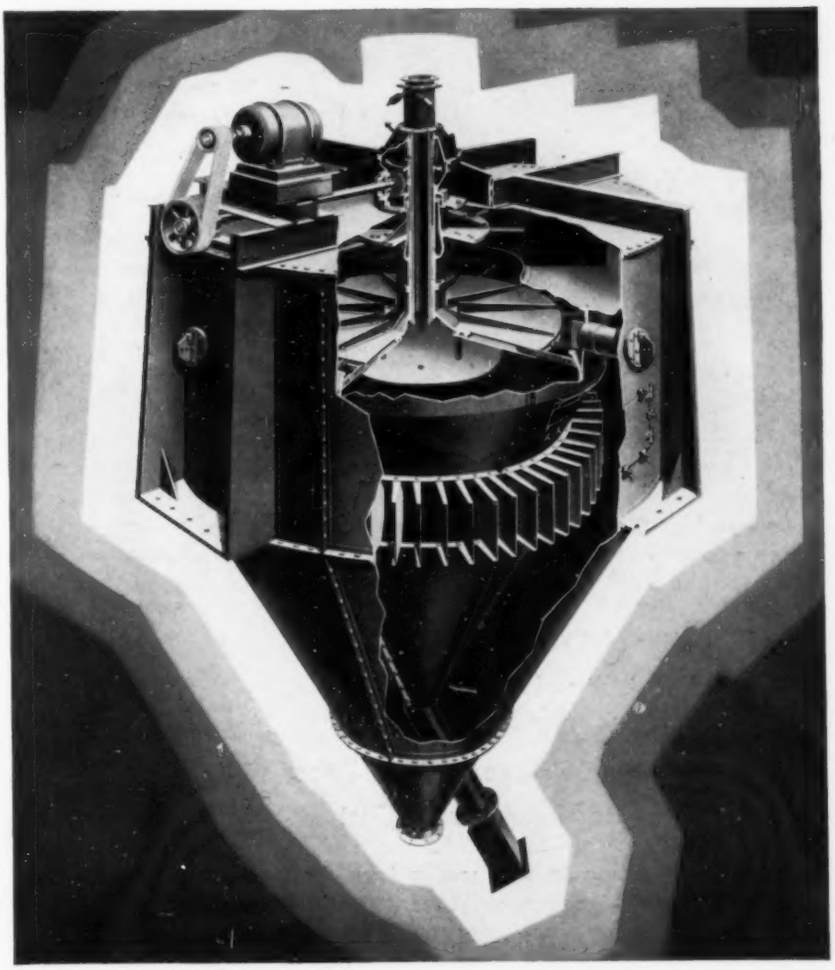
LEFT—The most modern development in gear enclosed, oil lubricated, double drive patented welded steel log washers for removing toughest clay and soft rock.

RIGHT—Mammoth all-steel Scrubbers complete with dewatering screen for any capacity.

Now the DOUBLE *Whizzer Raymond Separator*

Another advance in methods of producing the high surface area cements of today is offered in the modern *double whizzer type* Raymond Mechanical Air Separator. It gives closer separation of the fines, more accurate control over particle sizes and enables the operator to obtain any fineness desired by a simple adjustment made from the outside while the machine is running. Investigate this economical method of classifying finished cement to specific surface area of 1450 to 3000 or better.

. . . For Standard and High Early Strength CEMENT



Here's typical performance in a mid-western plant using a double whizzer separator in closed circuit with two 7′x26′ tube mills. Output increased to 80 barrels per hour at 2800 surface area as compared to former open circuit production of 70 barrels per hour at 1800 surface area, requiring re-grinding to get 2450 specific surface area on additional mills.

•

The same separator in closed circuit with one tube mill produces 150 barrels per hour of standard cement at 1600 surface area, as against 95 barrels in open circuit —a 57% gain by use of the Raymond Separator.

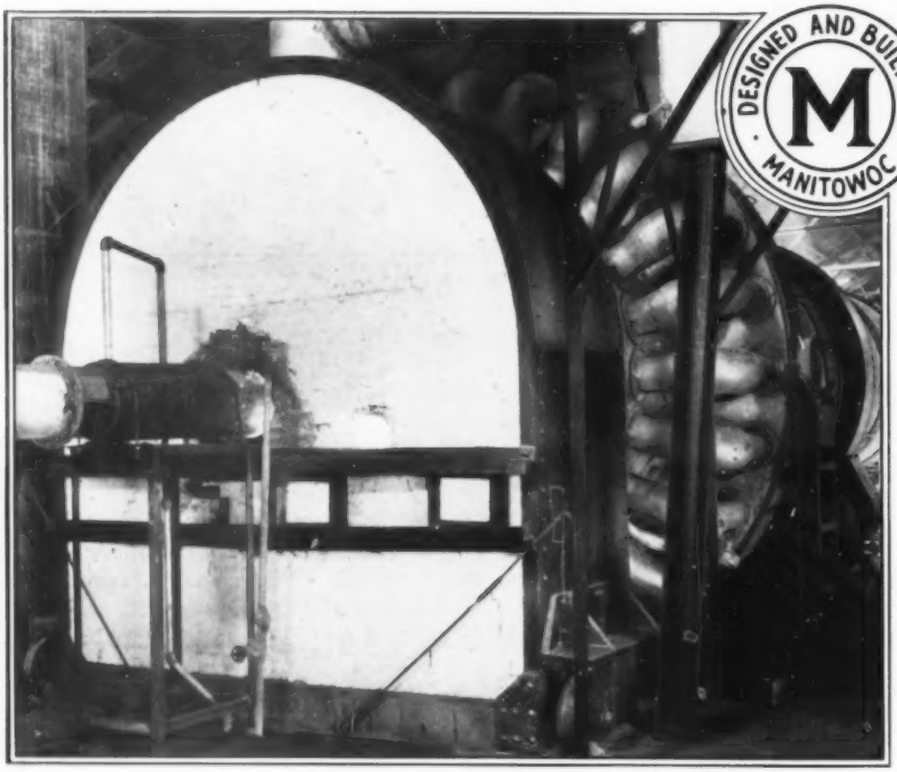
•

The operator is able to adjust the separator from the outside in a few minutes time, without any internal changes in the machine, to produce any surface area cement from 1800 to 2800.

Write for Separator Bulletin No. 35

RAYMOND PULVERIZER DIVISION
COMBUSTION ENGINEERING COMPANY, INC.
1307 North Branch Street CHICAGO
Sales Offices in Principal Cities • • • In Canada: Combustion Engineering Corporation, Ltd., Montreal

The VANDERWERP RECUPERATOR for Rotary Kilns



10-Ft. Cement Kiln Installation of Vanderwerp Recuperator

THE VANDERWERP RECUPERATOR is the simplest and most efficient means of accomplishing the initial cooling of the clinker with maximum heat recovery and full benefits in quality due to rapid air quenching.

The installation requires no alterations to existing structures, firing-hoods, or auxiliary equipment; excavations and foundations are unnecessary.

Space limitations in the kiln room in no case preclude the installation of Recuperators.

The Recuperator is now accepted as the one and only air-quenching type of cooler offering adequate protection against excessive expansion in high-magnesia cements. It insures:

- Improved Quality of Cement
- Better Grindability of Clinker
- Maximum Fuel Economy
- Highest Efficiency of Heat Recovery
- Low Maintenance Cost

Kiln operators interested in obtaining the maximum benefits from air quenching and heat recovery—with proven equipment—are requested to write, without obligation, for full particulars.

MANITOWOC ENGINEERING WORKS

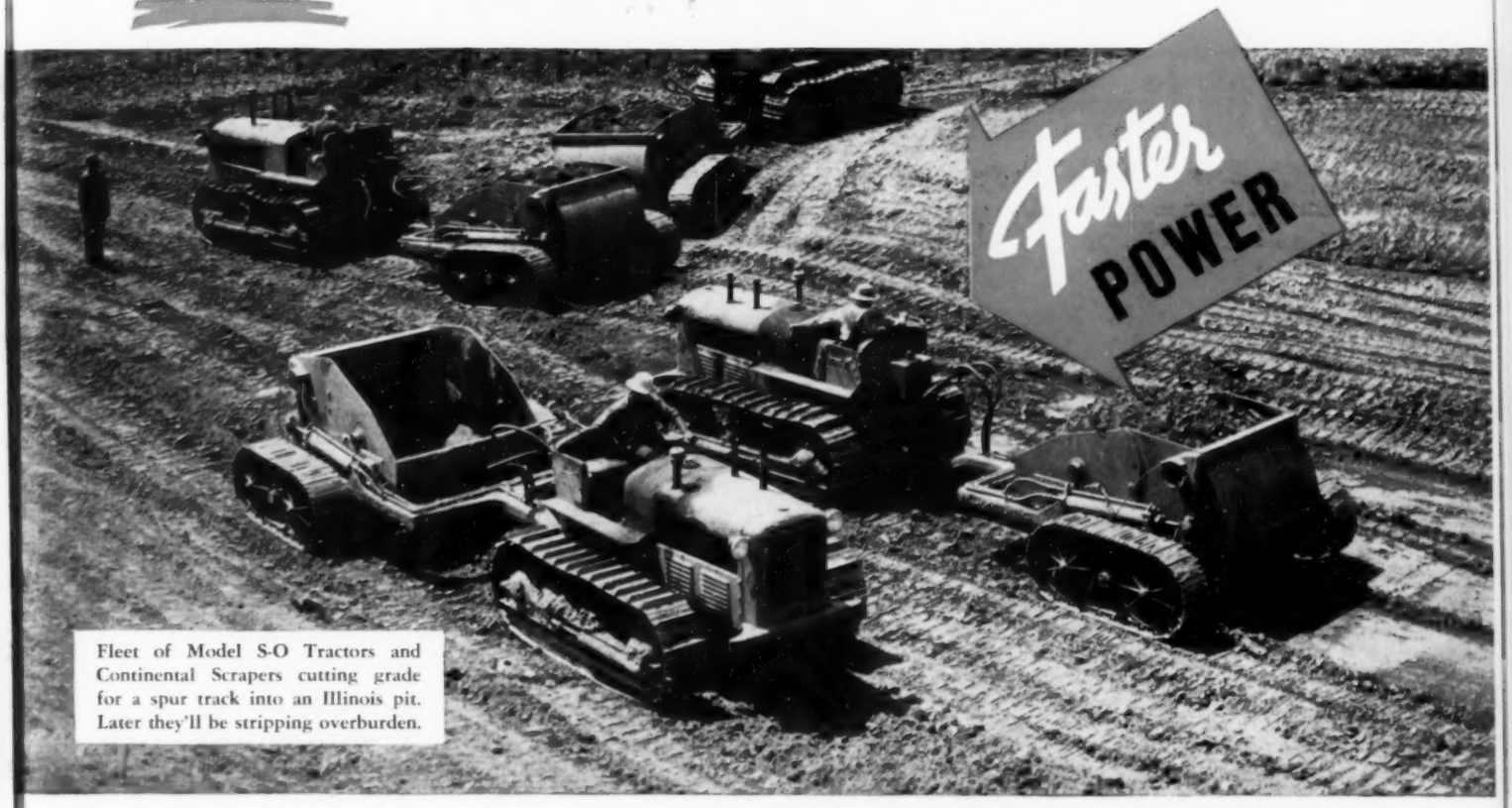
Division of

Manitowoc Ship Building Company

GENERAL OFFICES AND PLANT
Manitowoc, Wisconsin

CHICAGO OFFICE
131 E. River St.

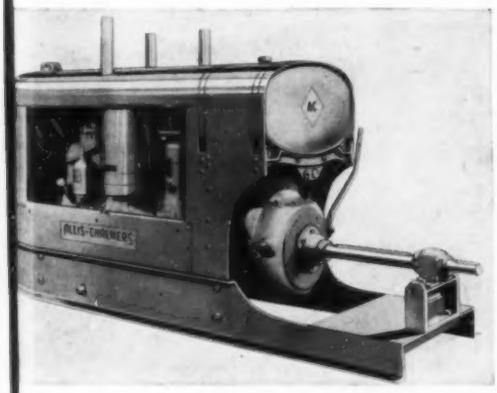
CUT STRIPPING COSTS



Fleet of Model S-O Tractors and Continental Scrapers cutting grade for a spur track into an Illinois pit. Later they'll be stripping overburden.

WITH ALLIS-CHALMERS TRACTORS AND CONTINENTAL SCRAPERS

. . . by digging overburden faster, by hauling it faster and dumping it faster. You can do it with this combination because A-C tractors start instantly and go right to work — no fussing with or waiting on auxiliary motors . . . because Continental's correct digging angle picks up heaping loads in a hurry, gets rid of those loads by end dumping . . . because A-C tractors have more and higher speeds — that means greater flexibility and the right speed for every task . . . because A-C tractor design eliminates speed-robbing deadweight — extra payload is gained by saving tractor weight . . . finally, because there's ample reserve power for lugging in tough going at low speeds, plus FASTER POWER in the higher speeds at which you do 90% of your work. It's this Faster Power which enables A-C tractors to climb steep grades faster, to maneuver easily and quickly in the pit, to strip overburden in a hurry, to cut the cost not only of stripping but of such other extra jobs as building truck roads, grading for spur tracks, materials handling, etc. Ask your nearest A-C tractor dealer to show you how FASTER POWER can help you.



A-C POWER UNITS Dependable, heavy-duty engines, job-proved in tractor service, for operating conveyor systems, separators, crushers, dredges, pumps and other mine machinery. Made in 4 sizes from 31 to 102 H.P. Write for descriptive booklet.

ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

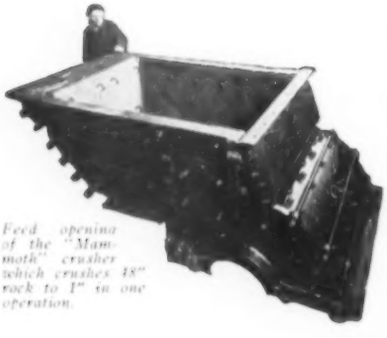
Controlled Ignition

OIL TRACTORS

Williams Hammer Crushers

Handle Larger Rock ○ 50% Less Investment ● Better Product

The "Jumbo Jr." which reduces "one-man" size limestone to 1", ¾" or agstone.



Feed opening of the "Mammoth" crusher which crushes 48" rock to 1" in one operation.

A Size for Every Job

The "Mammoth" crushes 48" rock to 3", 2" or 1" in one operation. Takes the place of a primary breaker and recrusher.

The "Jumbo" reduces 20" to 30" rock to 1¼" and smaller.

The "Jumbo Jr." crushes screen rejects or "one man" size rock to 1", ¾", ½" and finer.

The "NF" type is supreme as a recrusher for reducing 5" stone to 1", ½" or agricultural limestone.

The "Non-Clog" for crushing wet muddy rock. Cannot be clogged.

FINE GRINDERS • AIR SEPARATORS • DRYER MILLS

The Williams Patent Crusher & Pulverizer Co.

800 St. Louis Ave., St. Louis, Mo.

Sales Agencies in All Principal Cities Including

CHICAGO 37 W. VAN BUREN | NEW YORK 15 PARK ROW | SAN FRANCISCO 326 RIALTO BLDG.

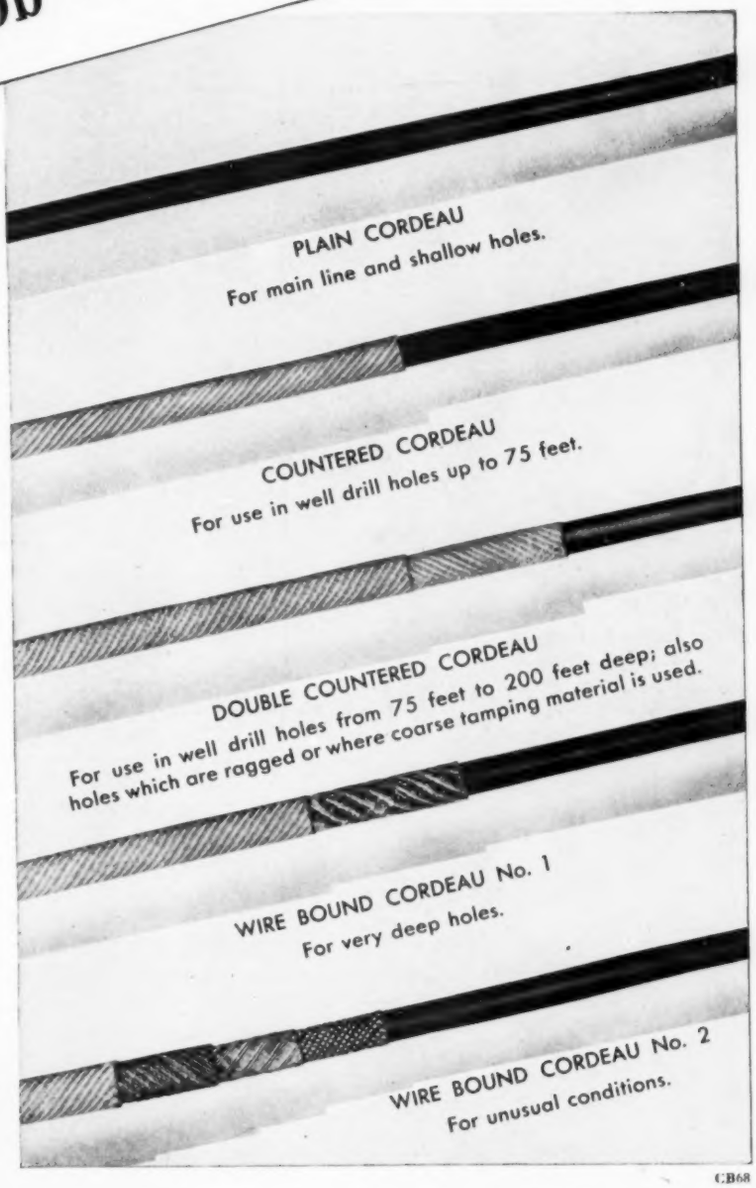
THE WILLIAMS PATENT CRUSHER & PULVERIZER CO. ST. LOUIS, MO. U.S.A. TRADE MARK

REG US PAT OFF

OLDEST AND LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD

PATENT CRUSHERS GRINDERS SHREDDERS

Use the *right* CORDEAU for the job . . . . .

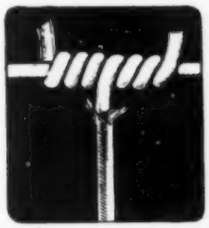

PLAIN CORDEAU
For main line and shallow holes.
COUNTERED CORDEAU
For use in well drill holes up to 75 feet.
DOUBLE COUNTERED CORDEAU
For use in well drill holes from 75 feet to 200 feet deep; also holes which are ragged or where coarse tamping material is used.
WIRE BOUND CORDEAU No. 1
For very deep holes.
WIRE BOUND CORDEAU No. 2
For unusual conditions.

CB68

EASY as choosing a collar button . . . yet the *right* type of Cordeau is *double* insurance of success in many blasting operations.

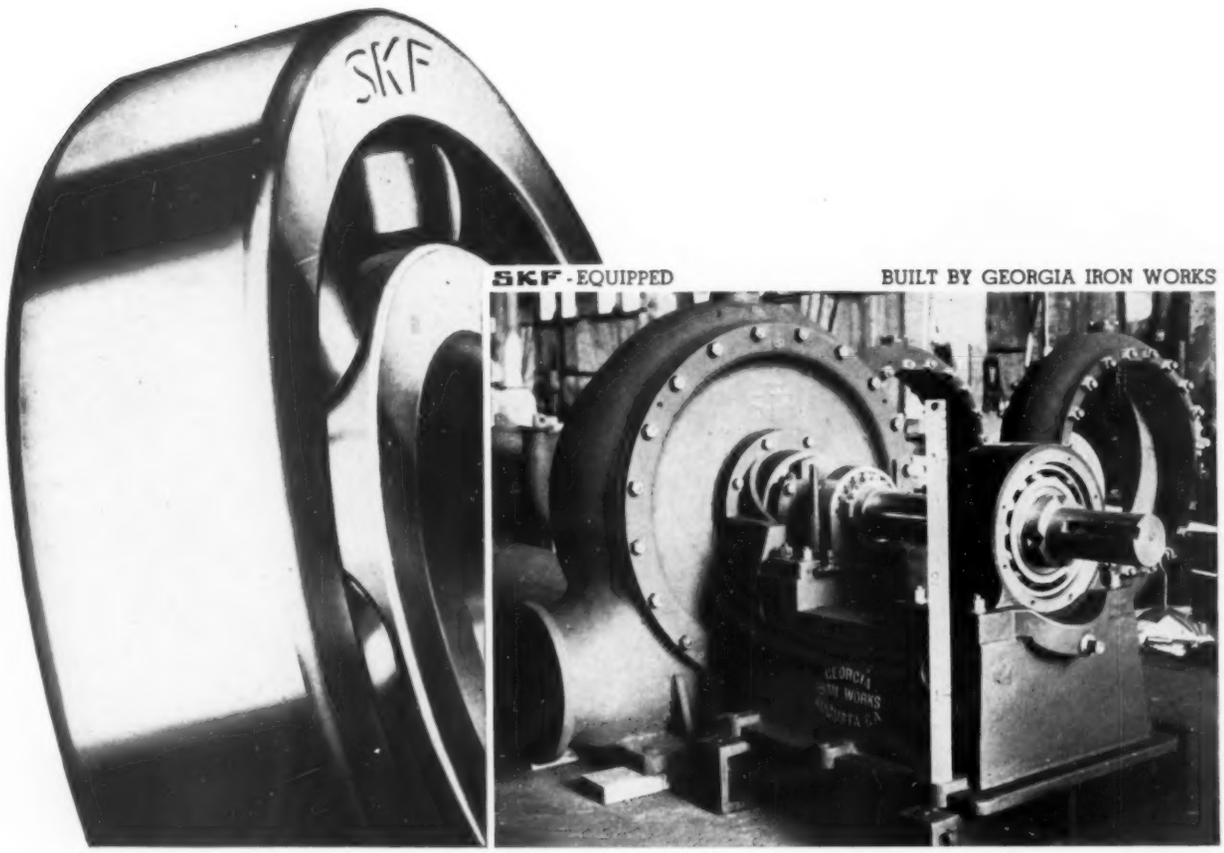
Cordeau-Bickford is an insensitive detonating fuse. It acts as the detonating agent for all cartridges in each hole, and it connects all holes. A single cap and fuse or electric blasting cap, applied to the proper main line of Cordeau above ground, detonates the entire blast.

At the right are shown five standard types of Cordeau-Bickford Detonating Fuse. Send for a copy of the Cordeau Book.



THE ENSIGN-BICKFORD COMPANY • SIMSBURY, CONN.

CORDEAU·BICKFORD *Detonating Fuse*



PUMPS WORK HARDER

when they depend on SKF *Bearings*

● HERE'S AN SKF-EQUIPPED DREDGE PUMP that's worked on the Merritt Dredging Company's dredge, "Cherokee". It is one of many brute jobs on which SKF's keep going when conventional type sleeve bearings fall down.

Ordinary bearings couldn't stand up on a Georgia 8" pump used on the Savannah Bluff Dam job. The head load, thrust coupled with the radial load from a 125 H.P. electric motor with exceptionally short pulley centers, was just too much for them. Only a few hours were needed to burn them out.

When SKF's replaced them, even more head was added with no trouble whatever. When you have a troublesome bearing, remember: "SKF always puts the right bearing in the right place."

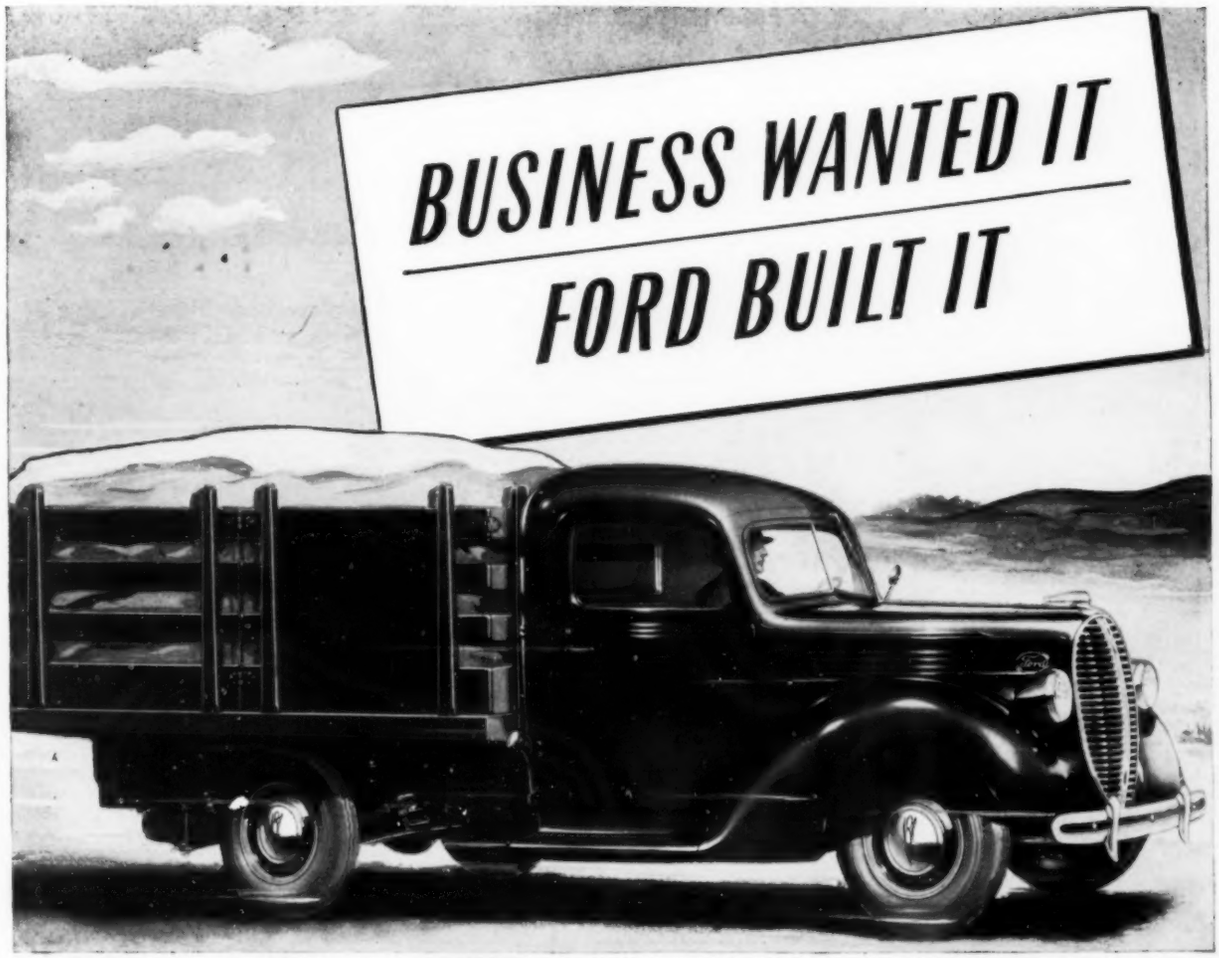
MORE THAN
1200
TYPES AND SIZES
Industry comes to SKF for unbiased bearing counsel because SKF makes practically all types of anti-friction bearings.

5943

SKF INDUSTRIES, INC., FRONT ST. & ERIE AVE., PHILA., PA.

SKF

BALL AND ROLLER BEARINGS



New One-Tonner BRINGS FORD V·8 ECONOMY TO ONE-TON RANGE

Many operators of hauling and delivery units have asked Ford to build a unit that would handle one-ton loads with the same proved performance and economy that Ford V-8 units of larger and smaller capacities bring to their respective fields. Result: The new Ford V-8 One-Tonner.

The One-Tonner has a 122-inch wheelbase. It has been designed to take advantage of the unusually economical 60-hp. V-8 engine, although the 85-hp. V-8 is also available where higher speed and faster acceleration are desired.

Though low in price, the One-Tonner has the time-proved features that make the larger Ford V-8 Trucks so reliable. Frame, springs and axles are designed for high reserve strength, without penalizing economy with excess weight.

Visit the nearest Ford dealer and arrange for an "on-the-job" test with your own loads and your own driver. While there, you will also see the new 1938 Ford V-8 134-inch and 157-inch wheelbase Trucks and the new 112-inch Commercial Cars — the finest, best looking units in all Ford history.

New Features of 1938 Ford V-8 Trucks

New styling • More comfortable cabs, more head room, new interior trim, softer seats • Quicker stopping brakes • New 134-inch wheelbase, improved load distribution • For 134 and 157 inch trucks, new standard frame width • Larger spindles • Easier steering, roller type with 18-inch wheel • TIME-PROVED FORD TRUCK FEATURES: V-8 engines, 85 and 60 hp. • Full-floating rear axle with tapered roller bearings • Straddle-mounted pinion, ring-gear thrust plate • Centri-Force Clutch, low pedal pressure, high torque capacity • Needle roller bearing universal joints on 134 and 157 inch trucks • Full torque-tube and radius-rod drive, free-shackled springs • Ford Engine and Parts Exchange Plan.

1938 FORD V·8 TRUCKS AND COMMERCIAL CARS

FORD'S SEVENTH YEAR OF V·8 SUCCESS

YOU CAN'T BLUFF Gilmer KABLE KORD

Trade Mark Reg. U. S. Pat. Office

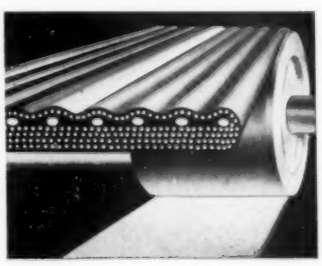
KABLE KORD is tough as the rear of a rhino. It's husky as a hippo's hide. It's a brute-strong bruiser of a belt that's built to do your *big* jobs.

Gilmer — *and only Gilmer* — builds Kable Kord. It's different from every other belt made. Kable Kord is "two-belts-in-one." Strong *pulling cords* and *contactor cords* are welded into a rubber-locked unit protected by a rugged jacket. The pulling cords transmit the load. The contactor cords give these pulling cords a no-slip grip on the pulley. Contactor cords and pulling cords are permanently fixed in place. So, no internal friction to tear out and wear out this belt. No time wasted taking up stretch. No power wasted by slippage. . . . Use Kable Kord and get *maximum power per square-inch.* Use Kable Kord to *save money!*

FREE

KABLE KORD DATA BOOK

Facts and figures about this patented wonder belt that comes endless and in rolls.



L. H. GILMER COMPANY, Tacony, Philadelphia
The Oldest Firm of Rubber Fabric Belt Specialists

new 603 KOEHRING

see it at the ROAD SHOW

KOEHRING HEAVY DUTY

Enclosed gears, anti-friction bearings, independent selective swing and travel speeds, and high line speeds, are a few outstanding advantages of the new Koehring 603 Excavator. It handles a 1½ yard dipper as a shovel, and is fully convertible to dragline, crane or pull shovel. See this new Excavator at the Road Show or write for the new 603 Bulletin.

KOEHRING COMPANY

Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks

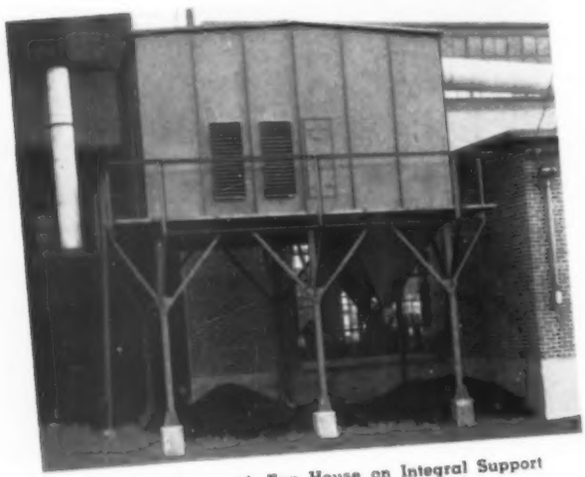
3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

The Inner Frame Being Removed from a Sly Dust Filter Bag

DUST CONTROL *through* POSITIVE FILTRATION

The Sly cloth bag filter is the key to the most complete and effective solution of the Dust problem.

Why experiment? Successful Dust Control by Sly is backed by 60 years of experience . . . Sly Dust Control Methods HAD to be efficient and economical to lead the field that long.



Sly Dust Filter with Fan House on Integral Support

● *Eliminate the Dust Nuisance in:*

ROCK CRUSHING
Trap Rock • Slate
Ore • Silica
Limestone

•

GRINDING
Rock • Cement Clinker
Gypsum • Ore

Conveyors
Elevators
Screening
Air Pumping Systems
Packing Operations
Bag Handling
Silos

THE W·W SLY MFG·CO·CLEVELAND·OHIO

Tisco

The soundest specification for wearing parts in 1938

TW

AT THE SHOW!

National Crushed Stone Convention: Jan. 24-26.

National Sand and Gravel Convention: Jan. 31-Feb. 3.

At either show, make it a point to drop in at the TISCO booth No. 10. If you are unable to attend, however, be sure to send for bulletins describing TISCO products.

Resolve, now, to include in all specifications for 1938, *wearing parts of TISCO Manganese Steel.* For no other steel provides the uniformly long and low-cost service which TISCO affords. For no other steel is TISCO made . . . with uniformly correct manganese content, and exacting control in every manufacturing and heat treating process. Be *sure* you get all the benefits of this tough, long-wearing steel in '38, by making sure all wearing parts are TISCO made.

PUMP PARTS • CUTTER HEADS • DIPPERS • DIPPER TEETH BUCKETS • RACK AND PINIONS • CONVEYOR CHAIN • JAW PLATES • CHEEK PLATES • MANTLES • SCREEN CLOTH WELDING ROD • GRINDING BALLS • HARD SURFACING ROD, ETC.

TAYLOR-WHARTON IRON AND STEEL COMPANY

HIGH BRIDGE, NEW JERSEY

PLANTS AT HIGH BRIDGE, N. J.—EASTON, PA.

Offices:

BOSTON • CHICAGO • CLEVELAND • CHARLESTON, W. VA. • DETROIT • NEW YORK • PHILADELPHIA • PITTSBURGH • SAN FRANCISCO • SCRANTON

STURTEVANT

The First STURTEVANT *Set a Precedent*

The installation of the first STURTEVANT AIR SEPARATORS revolutionized separation practice in the Cement Industry and opened the way to production of a product with a fineness never before believed possible. Since then 220 have been sold strictly on approval. Plant operators were allowed to install a STURTEVANT AIR SEPARATOR in their own plants to work on their own material and under their supervision. The fact that there has not been a single rejection is more than adequate proof of their superiority.

Operators everywhere recognize the big advantage of HIGH EARLY STRENGTH and they know that STURTEVANT AIR SEPARATORS produce it.

There is a size for every need. Write for complete details today.

CONSIDER THESE STURTEVANT FEATURES

Lower Temperature
Specific Surface Area
Particle Size Control
Quality Cements
Lower Production Cost
Increased Tonnage
Increased Mill Capacities
Separation of any fineness from 60 mesh to micron sizes.

STURTEVANT MILL CO. HARRISON SQUARE **BOSTON, MASS.**

.. Dipper sticks are tied together at the inner end to assure maximum resistance to strains and stresses.

..A husky welded boom—full box section —with sturdy, welded dipper sticks.

..An independent crowd that utilizes force normally wasted, giving extra digging power at the dipper lip.

.. Dipper is designed to facilitate the easy handling of large rock and to discharge easily and cleanly.

.. Backed by a high powered, slow speed engine that hangs on in tough going, it makes the ideal machine for The Quarry.

.. Crawlers mounted on heavy all-welded steel side frames with each tread supported by a roller —no chance of treads buckling up between rollers—no open spaces between treads to pick up stones or trash.

GASOLINE
ELECTRIC
DIESEL
OIL

Built in a range of 18 SIZES ⅜ yd. capacity and Larger

ROCK SHOVEL *Advantages that make NORTHWESTS ideal for The Quarry*

NORTHWEST ENGINEERING CO., 1807 Steger Bldg., 28 E. Jackson Blvd., Chicago, Ill.

NORTHWEST

DEPENDABLE *is a big word—*

One of three Plymouths at the Henry J. Kaiser gravel plant at Pleasanton, Calif. Illustrated is the 25-ton Plymouth Diesel.

BUT PLYMOUTH BEATS THEM ALL FOR *Dependable Service*

● STRONGER CONSTRUCTION, ample power and highest quality materials explain why *Plymouth* Industrial Locomotives rank high with all manufacturers who have haulage problems. A Plymouth in your plant will cut *your* haulage costs. It will stand up under the most strenuous operating conditions and give years and years of dependable service. If *you* want better performance, at lower cost, get in touch with—

PLYMOUTH LOCOMOTIVE WORKS, Division of The Fate-Root-Heath Co., Plymouth, Ohio

PLYMOUTH

GASOLINE • DIESEL • ELECTRIC • BUTANE • PROPANE

INDUSTRIAL LOCOMOTIVES

Renew GRINDING ACTION

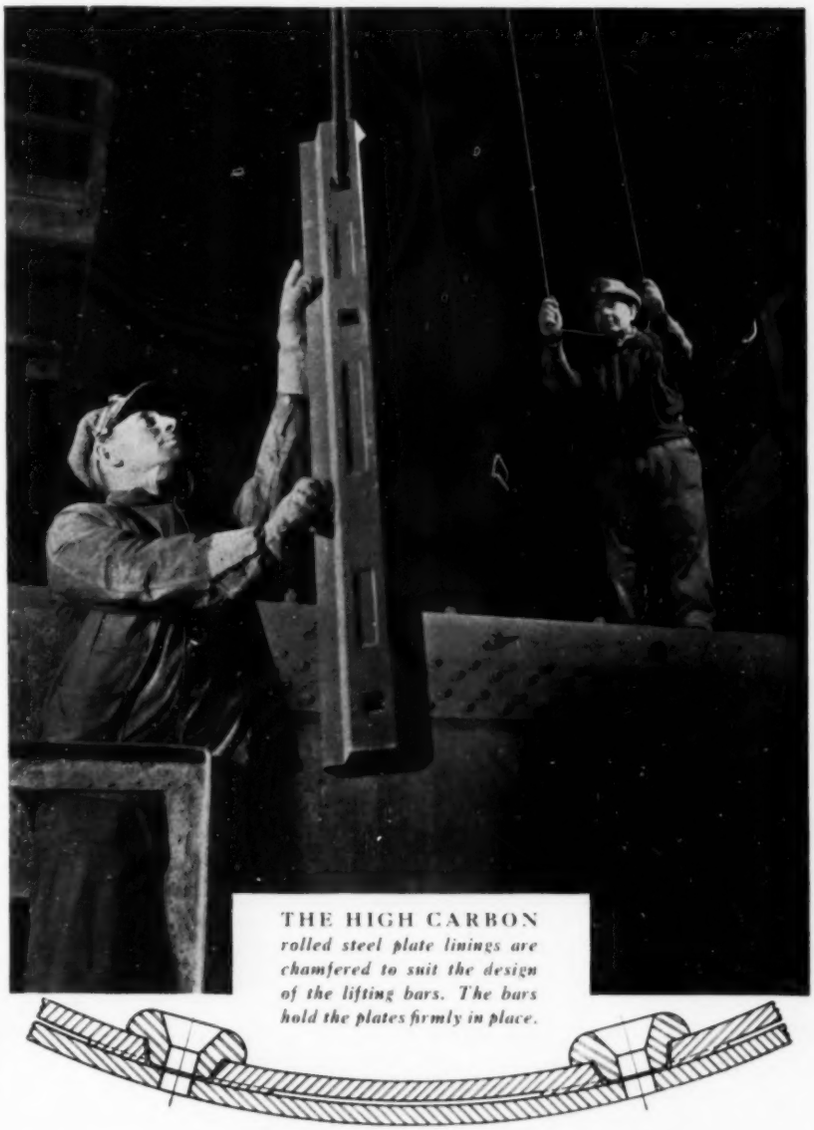
with this Lighter . . . Tougher . . . More Efficient Lining

DEVELOPMENT of the reversible lifting bar as an individual part of the new Lorain Rolled Steel Plate Lining establishes new standards of grinding efficiency and long life. Because the plates and lifting bars are separate units, the bars can be reversed or replaced without installing new plates. When one lifting edge is worn, reversal of the symmetrical bar places a less-worn edge in position to lift the load. Lifting action is thus renewed without any material replacement cost.

U·S·S Lorain Rolled Steel Plate Linings are *easy to install.* Their lighter weight makes handling easier than with the heavier cast materials. The liner plate itself is held firmly in place by the clamping effect of the self-wedged lifting bars on either side. Bolt holes in the lifting bar can be made to fit your present mill design.

The strength of Carnegie-Illinois Controlled High Carbon Steel allows a plate of reduced thickness. This means less weight in the lining, with proportional increased capacity for grinding materials, in both volume and weight.

Replace "down-at-the-heel" grinding mill linings with U·S·S Lorain Rolled Steel Plate Lining. It can be adapted to the type of grind, size of grinding balls and size of mill. Our engineering staff will gladly make recommendations on the application of this new grinding equipment in your own mills.



THE HIGH CARBON *rolled steel plate linings are chamfered to suit the design of the lifting bars. The bars hold the plates firmly in place.*

U·S·S LORAIN ROLLED STEEL PLATE LINING

CARNEGIE-ILLINOIS STEEL CORPORATION

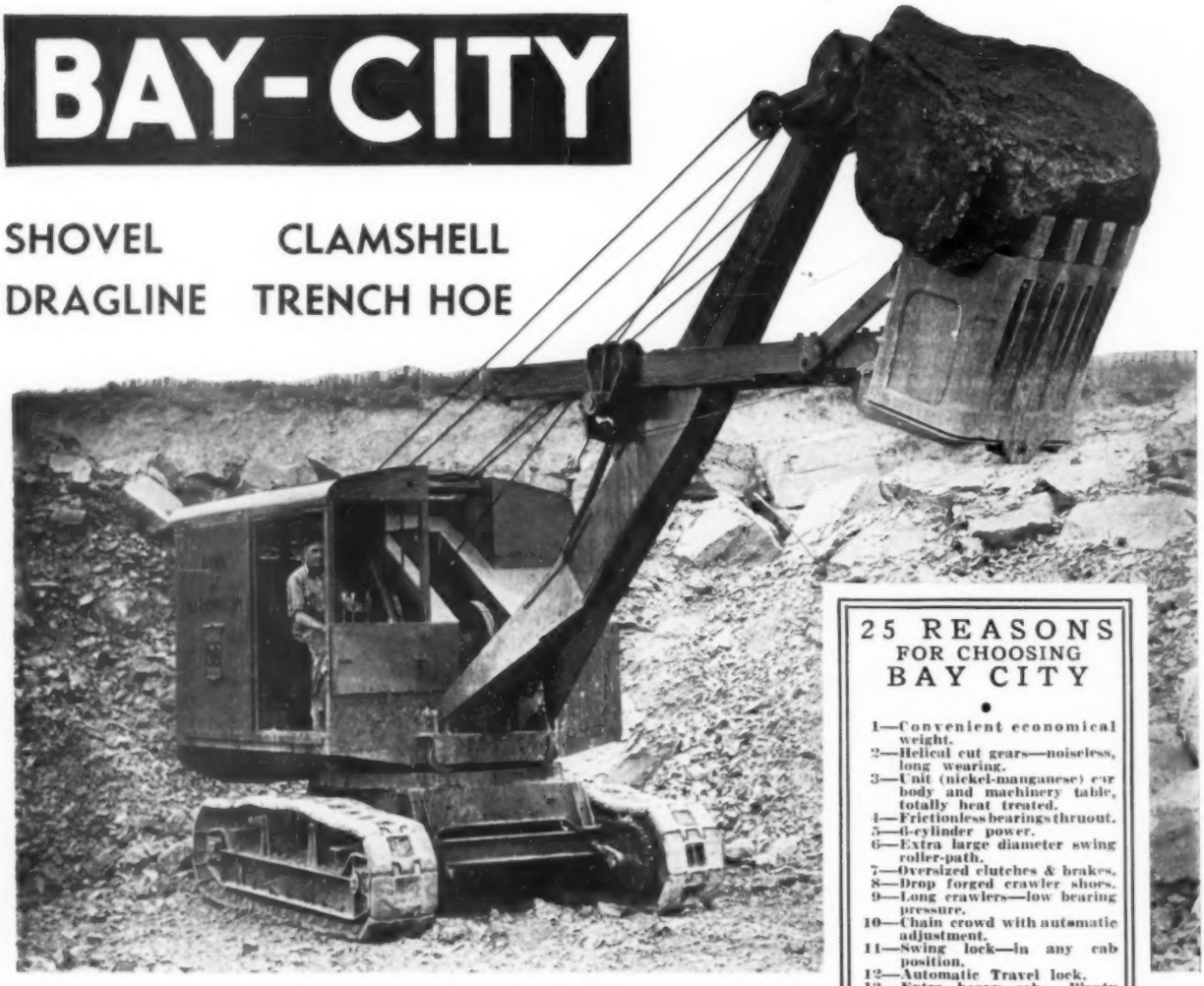
Lorain Division — *Johnstown, Pa.*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* — United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

BAY-CITY

SHOVEL CLAMSHELL
DRAGLINE TRENCH HOE



Illustrating Heavy Duty ⅜ yd. Diesel Powered Shovel

12 MODELS—⅜ to 1¼ Cubic Yard
Also ⅜, ½, ⅝ yd. Truck Mounted Shovels and Cranes

VISIT OUR EXHIBIT
ROAD SHOW — CLEVELAND — JAN. 17-21

25 REASONS FOR CHOOSING BAY CITY

1—Convenient economical weight.
2—Helical cut gears—noiseless, long wearing.
3—Unit (nickel-manganese) car body and machinery table, totally heat treated.
4—Frictionless bearings thruout.
5—6-cylinder power.
6—Extra large diameter swing roller-path.
7—Oversized clutches & brakes.
8—Drop forged crawler shoes.
9—Long crawlers—low bearing pressure.
10—Chain crowd with automatic adjustment.
11—Swing lock—in any cab position.
12—Automatic Travel lock.
13—Extra heavy cab. Plenty inside working room.
14—Fast operating speeds.
15—Two travel speeds.
16—All steel construction.
17—Three lever control.
18—E-Z clutch control.
19—High pressure lubrication thruout.
20—Safety worm boom hoist.
21—Separate hoist drums.
22—Internal swing teeth.
23—Unequalled steering at full speed.
24—Convertible — without machinery change.
25—Accessibility for inspection or adjustment.

CHAIN CROWD—UNIT CAST BODY AND REVOLVING TABLE, TOTALLY HEAT TREATED —DRUMS ON SEPARATE SHAFTS — HELICAL CUT GEARS — ANTIFRICTION BEARINGS —LARGE DIAMETER ROLLER PATH—ELECTRIC DIPPER TRIP—SAFETY WORM BOOM HOIST —SLOW ENGINE SPEEDS—AUTOMATIC TRAVEL LOCK—ALL PARTS ACCESSIBLE—ALLOY CAST BUCKETS.

BAY CITY is unalterably committed to these recognized quality ideals of design and construction for the reason that regardless of greater manufacturing cost they are definitely proven to be most desirable, economical and efficient in operating service.

You cannot equal BAY CITY value or performance—regardless of price.

SENSIBLY DESIGNED—CAREFULLY ENGINEERED — CONSCIENTIOUSLY MANUFACTURED— HONESTLY ADVERTISED—FAIRLY AND MODERATELY PRICED

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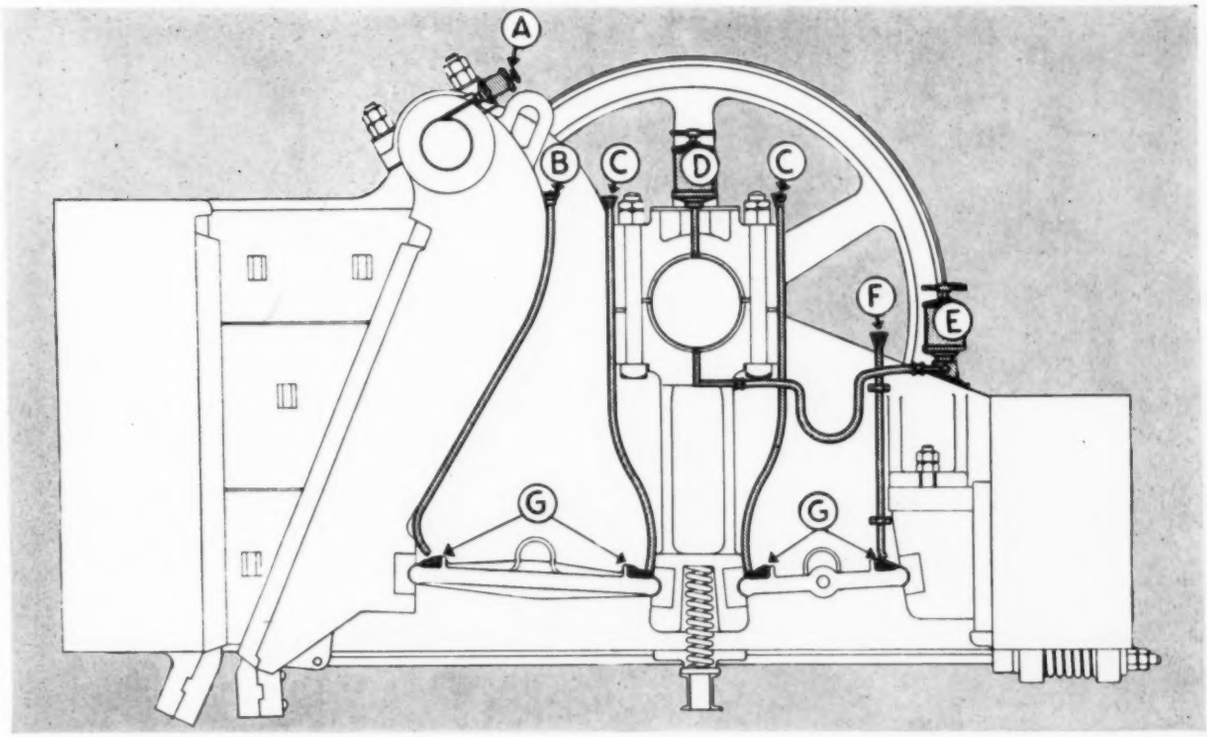

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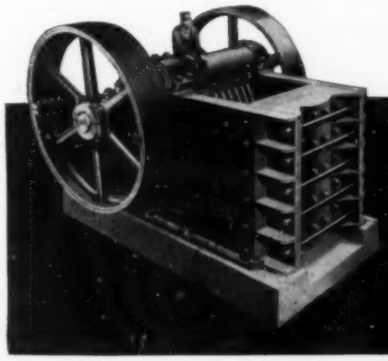

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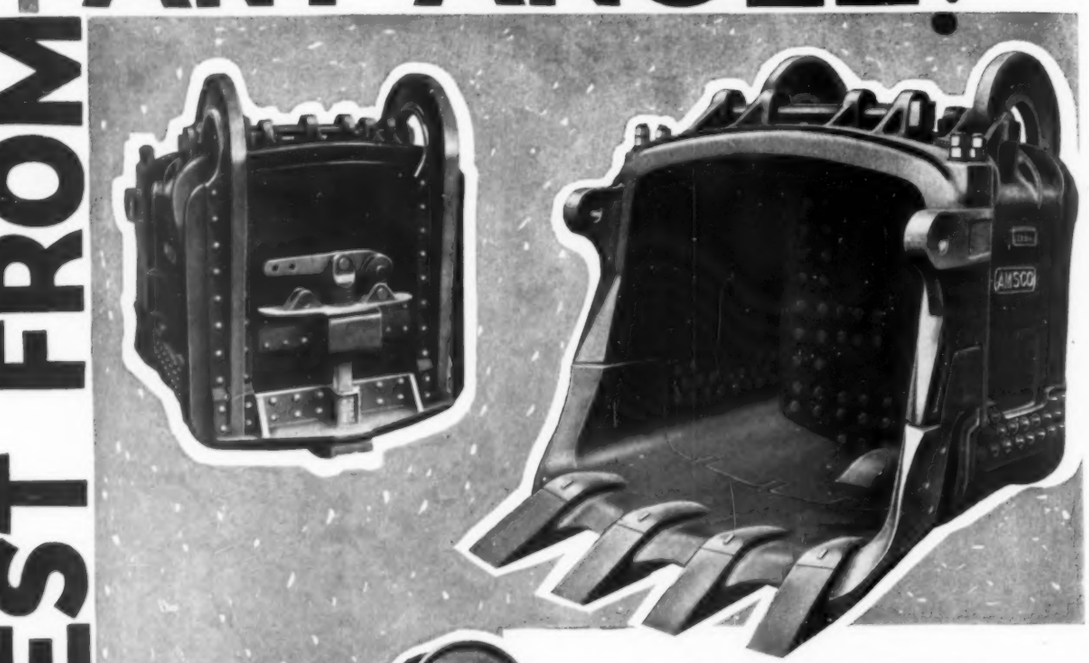

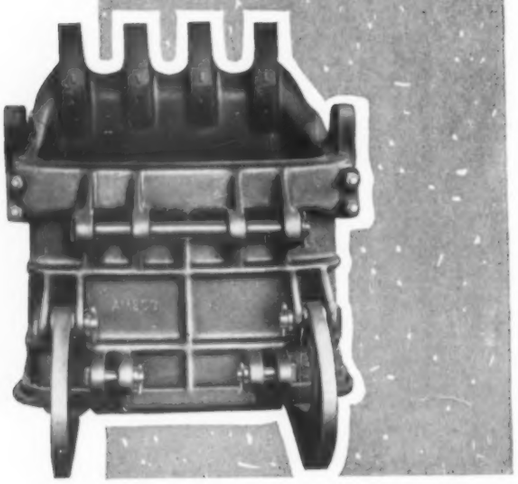

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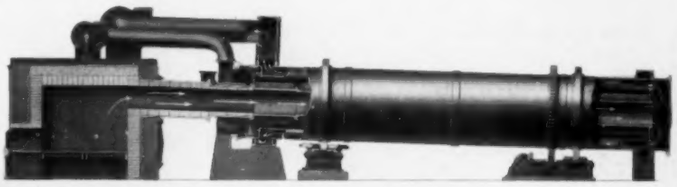
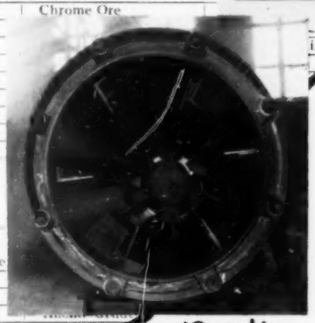
CLASS "XA" RUGGLES-COLES DRYER DATA

Size and Type of Dryer	Material	Type of Plant	Dried Weight Tons/hr.	Percent Moisture in feed	Percent in Discharge	Total H.P.
XA–1	Shale Granules	Roofing Mix	4.0	5.1	0.7	7.
XA–2	Soapstone	Fillers	4.5	12.	1.3	10.
XA–2	Charcoal	Chemical Mfg.	4.7	9.0	0.8	9.
XA–4	Fullers Earth	Oil Filtering	5.2	15.	7.0	12.
XA–8	Manganese Ore	Furnace Saving	10.0	13.5	1.5	15.
XA–8	Pyrite Concentrates	Metallurgical Plant	5.7	14.	1.2	14.
XA–10	Silica Sand	Glass Mfg.	19.0	5.8	0.3	21.
XA–10	Bituminous Coal	Powdered Coal	12.5	8.1	0.9	20.
XA–10	Lime Sludge	Fertilizer	1.2	55.	3.0	22.
XA–12	Coke Breeze	Chemical Mfg.	11.0	14.2	0.4	32.
XA–12	Gypsum Rock	Plaster	14.	14.5	0.8	
XA–14	Coke					
XA–14	Anthracite Coal					
XA–14	Bituminous Coal					
XA–14	Sewage Sludge					
XA–18	Iron Ore					

CL

Size and Type of Dryer	Material
XF–1	Metal Chips
XF–2	Feldspar
XF–2	Ilmenite
XF–4	Chrome Ore
XF–4	
XF–8	
XF–8	
XF–10	
XF–10	
XF–12	
XF–14	
XF–14	





Size and Type of Dryer	
XB–2	
XB–2	
XB–8	
XB–8	Talc Rock
XB–10	
XB–10	
XB–10	
XB–12	
XB–1	
XB–	

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The Publishers

Rock Products

Vol. 41 Chicago, January, 1938 No. 1

Editors Present a Summary of

PROGRESS and TRENDS

WHEN AN INDUSTRY has spent several years in poverty, having great difficulty to make both ends meet, and through a year of relatively profitable operation "comes into the money" again, there is naturally a good deal of curiosity in the industry as to what is done with the money, or with the credit that earnings bring to those who are able to make them. Moreover, there is a public interest, or social interest, too, as to how these earnings or profits are used. That is the question the editors have attempted to answer in this issue as to the earnings of 1936 and their spending in 1937, insofar as space limitations permit.

In doing this, as far as possible, the editors have generalized and summarized with the object of showing innovations, developments in progress and trends. Specific installations are mentioned only as illustrations. From many interviews with men of the industry, we are convinced that this is the kind of service our readers want in an Annual Review issue. It is harder for them to generalize from scattered descriptions of various different plants than it is for us, because we see many plants in the course of a year which are not described in print, and we can thus give the benefit of our observations and conclusions. In addition we have called upon our many friends for advice and suggestions, for which grateful acknowledgement is made.

One thing is as clear as the moon on a cloudless night. The first spending money this industry has had in several years, over and above that necessary to meet payrolls and interest charges, has gone into new machinery and equipment to bring plants as nearly up-to-date as such limited funds would permit. It is apparent that such purchases as have been made for this purpose are but an earnest of what this industry expects and intends to make if it is given an opportunity to make profits.

Labor Saving Not Sole Objective

In this industry at least most such purchases of equipment were not made solely, or in many cases primarily, for labor-saving purposes. They were made because of changing demands for the products of the industry, or possibly more accurately, because of demands for changed products. This point is worth emphasis because we have heard of employers in this industry whose unionized employes are objecting to the installation of modern equipment on the ground that it is designed to replace their labor.

Such a point of view on the part of labor is short-sighted and mistaken, even though natural. If their employers fail to keep up with the procession in the way of progressive replacement of obsolete equipment with new and better, the laborers themselves will soon be out of all work, as their employer will soon be out of all production. And if men in other places are not engaged in building this new and better equipment, the rock products' plant employe is contributing to their support on relief, or he will be on relief himself for lack of customers for the output of rock products.

The make-work program of W.P.A. seems to have had strange reactions on many lightweight minds. When a cubic yard of inferior gravel is produced by W. P. A. at a cost of $10, and the same cubic yard of superior material could have been purchased for 90c or $1, the $9 of W. P. A. money (or government credit) is economically wasted just as much as if it had been taken and thrown into the sea. The production of the most wealth (which is useful commodities, not paper money), with the least expenditure of labor and capital cost, which is the only way that will permit their widest distribution, is obviously the only way we can have abundance and a higher standard of living.

The willingness and alacrity with which the rock products industry spends its first earnings to make better commodities at less cost, if possible, is ample assurance that most employers have an understanding of these simple economic relationships. In time we believe all their employes will have an understanding, too; but just now they are being misled by an active bunch of agitators in Washington, D. C., and elsewhere, whose real desire appears to be the wrecking of all industry.

We see no reason for worry about the present business recession. We face conditions today almost a parallel with those in 1920 and 1921. There is a pent-up demand for an enormous amount of new construction and reconstruction in nearly every branch of industry and in the commercial and housing field, just as there was then. Prices and wages in 1937 rose a little too fast for the public to take—just as they rose too rapidly in 1920 or 1921—and there is now as there was then a temporary buyers' strike, until some prices and wages are readjusted and the public is convinced again that it is getting a *fair deal*. For the American public seems to have reached the point where it is getting fed up on *new deals* and asks only a fair deal. It is a healthful sign; and we believe it will usher in a new period of record-breaking prosperity—in spite of what may happen in Washington, D. C.

COMMENTS—

By BUSINESS LEADERS

M. H. Baker

Man Who Provides The Cash For Payrolls Must Be Realistic

By M. H. BAKER

President, National Gypsum Co.

THE PRESENT RECESSION has obscured our perspective, confused the minds of our people and has forced much criticism of government. An open discussion of New Deal legislation is helpful to our law makers; but I believe business would be better off if managements could concentrate their efforts on things to directly improve their own business.

For years, social standards have been going through a process of changing. The depression merely acted to make possible a more rapid change under the popular leadership of our present administration. This was inevitable, and disturbing as it may be, out of this will finally come new opportunities for industry.

The man who provides cash with which to meet the pay roll must be realistic. He naturally cannot reconcile practical things with the government's labor policy, tax system, spending and promotion of class hatred. I prefer to believe these extremes came as a result of too rapid change in the social order and not from any deliberate planning for change in the capitalistic system.

Leadership to the Fore

Radical changes have happened before and were just as confusing. Always practical minds from among employes and employers have asserted leadership and brought order out of chaos resulting in new standards that pointed the way to a new era for industry.

Industry has come a long way since 1933, and the fact that many businesses have established new earning records need not be disturbing to us in the building field. The fact that business reached 90 percent of so-called normal, while building remained at a low of 35 percent, points to what can yet be expected in our field.

The major part of all gypsum, lime, sand, gravel and stone must be used in building construction. Because of low activity in building, producers have been operating at less than 50 percent capacity. With the large investment required in plants and millions of people necessary to operate them, a tremendous burden has been thrown on management to conserve their stockholders' assets, meet the demands of government and labor.

The normal way to improvement in this field was checked by the present recession which acted to further accentuate our difficulties. Can one of our largest industries lag so far behind without finally becoming an anchor to hold back general business? It seems natural to expect building will follow any pick-up in employment and general improvement in business. That has been its history.

Prices Not High

There is nothing wrong with prices. Building can be done for less than in 1929 and very little more than in 1925, even though building labor and plant wages are much higher. Actually, prices for plaster, wallboard, lime and insulation are on the average lower than five years ago.

Ability to absorb rapidly mounting costs resulting from labor increases, raw materials and taxes, without any increase in price, is a tribute to operating genius. With further reduction in volume, this cannot continue without exhausting working capital and finally causing abandonment of plants.

Reductions can be made in cost and likewise in selling price through installation of new machinery and plant modernization. Overhead can be reduced through the manufacture of new and additional products. Such a program would involve new capital. Upwards of $10,000,000 could be used to advantage in this field. But under the new system of taxing undistributed profits this money cannot be had without too great a sacrifice.

The products we manufacture are basic and essential to low cost construction. Their future is the future of building. Since any recovery in this field is tied up with progress of industry as a whole, it is to the interest of producers to co-operate with any practical means that will improve industry.

No Quarrel Over Objectives

No well posted management will disagree with President Roosevelt's objective to improve income position of the underprivileged one-third and to make secure any gains through regulatory laws governing the following:

(1) The unscrupulous so-called chiseler in business, finance and labor.

(2) Better working conditions and wages comparable with what business can afford.

(3) Low prices that will permit labor and those with low income to buy more.

(4) Discrimination among employes because of their affiliation with any union selected by their free will.

Management has no quarrel with the intent of these regulations. It is not the objective but the procedure that has harmed business. Surely such a worthy objective can be obtained with-

out destroying the source of income. Since laws that are not workable will fail in their purpose, it seems only logical for business and government to co-operate in a program acceptable to each. The following would, I believe, be helpful to our business:

What Business Needs

(1) Repeal the tax on undistributed profit and on capital gains.

(2) Stimulate interest in building by enacting the program contained in the President's message to Congress of November 29th. This, however, should make possible mortgage insurance through a minimum of delay and annoyance acceptable to local financial institutions.

(3) Enact new legislation to cause labor unions to publish a report of income and disbursements and to make the union as a body responsible for acts of its members when operating under a contract that has been properly negotiated and signed by management and labor.

(4) Eliminate the use of government funds where used to compete directly with private capital in housing projects, utilities and the like.

(5) Outline a constructive policy covering monopolistic practices, then sit down with industry and prepare workable legislation so that industry and capital will know what to expect.

(6) Reduce expenditures and if necessary increase taxes to show a balanced budget for 1939.

Under this program businesses in our field could command capital and genius necessary to growth, create new wealth, take up unemployment and thus contribute to a higher standard of living. Such team work between business and Washington is in my estimation the only way to secure New Deal objectives.

A Crushed Slag Producer's Reactions to Federal Laws and Taxes

By HARRIS N. SNYDER

Secretary-Treasurer, Buffalo Slag Co.

BEFORE DISCUSSING the effect of some Federal legislation and activities on business I should like to explain that the business of the slag industry, with which I am connected, is processing and marketing blast-furnace slag. The principal markets for its products are found in the field of highway construction and ballast for railroads. Private building construction is also an important outlet. Slag, in these fields, is competitive with crushed stone and gravel. It is not so widely distributed over the country as its competitors; for its source of supply is confined to the iron producing centers where blast furnaces are located for the reduction of iron ore, through which process the raw material for the slag industry is produced.

The activities of the present Federal Administration to end the depression and to prevent recurrences have occupied a great deal of attention. I have found myself sympathetic with the desires of the administration to get people back to work, and to see what can be done to prevent such violent disturbances. I also have been disturbed by some of the methods used, the mounting debt and the unbalanced budget.

Provisions Against Unemployment

Unemployment has been the big problem. Treatment of the man who works for others has been improving with the years. The present administration has tried to spur on this improvement, not satisfied with the rate of past progress. When the subject is dealt with, it immediately gives rise to the charge of political advantage to be gained by the sponsor of labor measures as the motive animating him to action. Whether this has played any part or not in the many enactments and proposals affecting labor, I believe it is true that the large amount of unemployment resulting from the depression of 1929 has caused many, including officialdom, to realize that the wage earner must have some protection against a recurrence of such happenings.

Harris N. Snyder

Many companies, in fact most of them, in the years prior to 1929, made large returns on their investments. Few of them had plans in effect to provide any relief for their employes in hard times. Consequently, the Government rushed to correct this condition. It provided for collective bargaining; limiting hours of work with minimum rates of pay, of which the Walsh-Healey Act is one example, and the pending hours and wages bill another; unemployment insurance, old age pensions, etc. I am in favor of funds set up to provide for unemployment and old age. I have thought that other ways of handling them might have been legalized, but I think it is commendable that a start has been made, and now, with the unemployment rolls again mounting, the system will come to a test sooner than expected.

Our industry has found it difficult to increase employment, partly for reasons which government has the power to correct.

Statistics of the Bureau of Mines show the inroads that government production of sand, gravel and crushed stone has made on the production of these materials. Crushed blast furnace slag, being a competitor of these materials, is thereby affected by such government competition. The WPA has contributed to the expansion of this competition by employing men to break stone by hand and by the hand screening of the materials mentioned. The cost of some of this WPA material so produced has been as much as $10 per ton, whereas the range of prices for the commercially produced material is from 60c to $1.25 per ton.

While it is obvious that more hours of work are provided by WPA methods than by a commercial plant, government production lessens the opportunity of companies engaged in the preparation of materials to increase employment.

Increasing the volume of a commercial plant has far-reaching effects. Not only in direct employment is it felt, but in its increased use of supplies and services. Purchasing power is stimulated.

An argument against the use of relief workers in this field is not to argue that commercial plants should come first, even at the expense of the needy. Of course, needy folks must be provided for; but if this provision takes a form which decreases employment in established in-

dustry, it is impossible to see how such industry can be expected to find places for the unemployed.

Many people have expressed surprise, in these years when so much money has been appropriated for construction, when told that the volume of commercially produced aggregates is very low compared to former years before the depression. I think it is a fact that industries dependent on construction activities have usually had good business in times when general business was in a slump, but that has not been true of this business slump.

Misuse of Highway Funds

In the slag business, as well as in the business of all highway construction materials, we have not only lost tonnage because of government entering the production field, but the funds supporting much of the highway construction activity have been diverted to other uses. The automobile owner is taxed for a license to own, a license to drive, and also is taxed on the fuel used. The funds thus obtained are in most cases levied for the purpose of constructing and maintaining a highway system; and many states produce all the funds necessary to provide proper highways. It is a matter of record, recognized in some Federal highway legislation, that millions of dollars of these funds have been diverted to the general purposes of government, of which relief has been the outstanding item.

There is a great need for more and better highways, if for no other reason than to lessen the terrific accident toll of motor traffic. Their construction means much to employment, as has been shown by the U. S. Bureau of Roads. The estimate is that about 85 percent of each dollar spent goes to labor, both in direct and indirect employment.

Thus it will be seen that if the funds normally supporting an industry are taken away, and the products of such industry produced in increasing measure by government, such industry cannot absorb the unemployment or increase its expenditures for machinery, supplies or services.

Certain taxes and the application of the funds collected have been and are the concern of this industry. So long as expenditures continue at a high rate, the problem of taxation will be impressive. It would seem unlikely that the burden will be much lighter for many years, yet some of the measures seem to be working against the best interests of all. I will only mention two.

Taxes Prevent Employment

The tax on undistributed profits has forced the paying out of money needed in the business, but it costs too much to keep. In cases where debt existed and could not be met without using profits, it works a hardship. The law requires disbursement of funds to stockholders, which, if kept in the business, would permit giving employment in slack times or permit needed improvements in plant and equipment. Many businesses cannot command public financing, and banks do not lend money for fixed capital purposes. If there has been abuse of stockholders' rights in the retention of profits, which cannot be corrected by the stockholders' voting privileges, then the law should be aimed only to correct such abuse. The operation of this tax thus far has demonstrated so many bad results that it should be promptly modified or abandoned completely.

The other tax to which I want to refer are Federal taxes on gasoline, motor oils, etc., the so-called motor vehicle taxes. It is not the tax itself of which I complain, but the mis-use of the money collected. The Federal Government penalizes the States in the distribution of Federal Aid for highways if the States have diverted their motor taxes to uses other than construction and repair of highways; and yet it collects taxes from the same sources in a Federal fund in amounts greater than it applies to that purpose. Neither the States nor the Federal Government should use the automobile as a base of taxation, except to provide facilities in connection with their operation. The effect of diversion of these funds has been pointed out previously in this article.

Government Income Requires Business Stability

Taxes are the Government's income. The expected return from taxes of various sorts is estimated by the Treasury Department from time to time, but the estimated income frequently is not realized because of upsets of one kind or another. Therefore, measures that will make for stability in the sources of such taxes are important. One of the large sources is income from business. The Administration has apparently recognized the effect of price competition on the stability of the earning power of business, as indicated by such legislation as the Robinson-Patman Act and the Miller-Tydings Act. Also the fixing of prices by the Bituminous Coal Commission is another example of their concern. The NRA Code of our industry provided for the Open Price Policy, that is, published prices.

The Robinson-Patman Act does not permit of discrimination in prices, but allows meeting of prices. It does not, however, provide a plan for knowing what the price is which you may meet. This Act also is limited to interstate business, whereas most of the business of our industry is intra-state in character.

Without knowledge of what the competition is, prices steadily move lower. As an example, I may try to maintain a one-price policy for my product, when I find the customer claiming lower prices from a competitor, which I am persuaded to meet. My competitor, having lost the business, feels he must lower his price against me on the next order, with the result that in a short time prices are at a level below that at which a profit can be made, which reduces tax returns, causes reduction in wages and requires lay-offs as soon as any opportunity offers. If prices had to be published and sales made according to such published prices, there would be no guessing as to your competitor's price which you should have the opportunity of meeting.

There is, of course, the possibility of "deals on the side," rebates, inducements of various sorts, which are all unfair trade practices for which the recipient should be as guilty as the donor.

Price publication, and the requirement that sales shall be made at such prices, in order to be effective, should apply to intra-state business. No elaborate Governmental administration need be created in connection with such a requirement.

Reform Legislation

There are, of course, other matters of legislation with which we are concerned, such as Hours and Wages; Collective Bargaining, etc., which are of a more general nature as to business than some of the matters I have touched on. As previously stated, I believe we should make progress in ways that provide steady employment at fair compensation. Laws are an aid in bringing about reform; but after all, improvement will be made only as individuals have more regard for the well being of others.

Experimenting for the good of the greatest numbers should not be condemned, but it should not be undertaken until after careful study and research, and not too much undertaken at one time. The desire for accomplishment often leads to impatience and a tendency to act too soon. Business men in this industry are probably much the same as the average, and most of them have come up from the ranks. They are not only willing but anxious to improve conditions of employment as well as other phases of their business.

I have tried to point out herein some of the places where Government can aid this industry, and by so doing we can team up to the benefit of all.

STRIPPING BLASTING and EXCAVATION

By BROR NORDBERG

NEW METHODS FOR GETTING rock products from the mine, quarry or pit to the crushing and screening plants, were introduced in 1937 at some plants, and there is evidence of further development along lines initiated a few years ago. This is true in stripping and blasting as well as in hauling practices.

In removing overburden, the majority of plants are following conventional procedures. Probably the most significant development has been the application of "contractors' " type of earth-handling equipment, powered by tractors, for the removal and disposal of overburden.

By the use of this equipment powered by Diesel engine, a number of sand and gravel and stone operators are finding the removal of overburden to depths of 30 or 40 ft. or more practical and economical.

At Oglesby, Ill., the Marquette Cement Manufacturing Co., in opening a new quarry, is loading overburden direct by shovel to Athey 13-cu. yd. two-way dump wagons which are delivered direct to the spoil-bank by Caterpillar Diesel RD8 tractors. About 450,000 cu. yd. of material, 30 ft. in depth, are to be removed in this operation.

At Ottawa, Ill., the Ottawa Silica Co. uses a Le Tourneau U-12 "Carryall" and a Le Tourneau Angledozer in combination with a Caterpillar RD8 tractor for stripping. The procedure at this plant is for the scraper to dump next to the pit edge, and on the next trip the Angledozer pushes the preceding dumped load into the pit.

A large sand and gravel producer has recently installed two RD8 Caterpillar tractor and U-12 "Carryall" units to strip overburden at its several plants. The overburden at these plants averages about 4 ft. in depth. The practice is to remove, in two months, enough overburden to keep each plant operating for a year. An Illinois producer, in addition to using this type of equipment for stripping, has excavated sand and gravel direct from the bank and is anticipating substituting tractor equipment for a dredge.

These are but a few typical cases, others of which are shown in the illustrations. At all the plants using these

In opening a quarry at Oglesby, Ill., Marquette Cement Manufacturing Co. removed 450,000 cu. yd. of earth. In the illustration is shown two of the 13-cu. yd. Athey two-way dump wagons and Caterpillar RD8 Diesel tractors which were used to dispose of the overburden

types of equipment, with which we are familiar, they have been put to use around the plant for general utility purposes as well as for excavation.

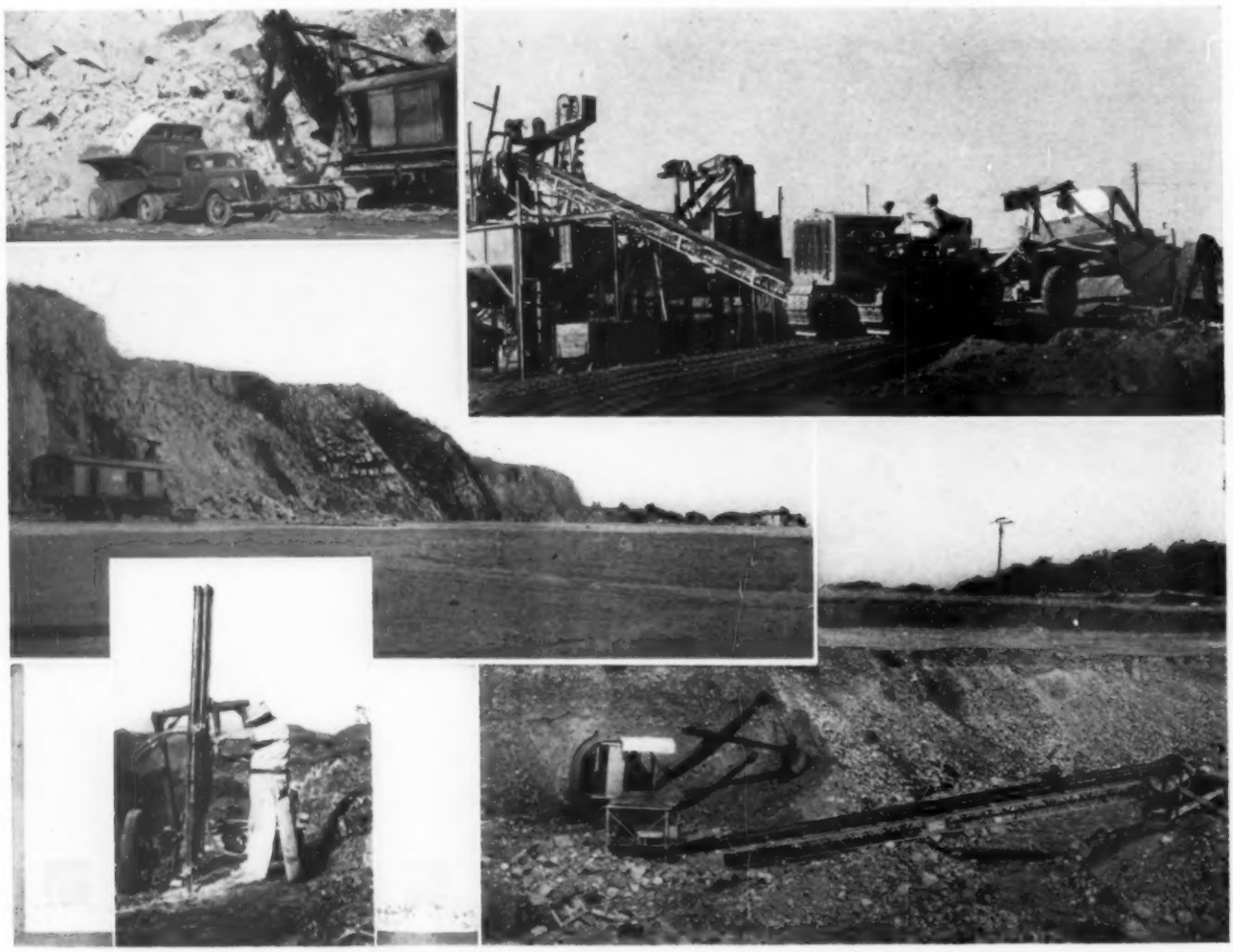
For example, in addition to removing overburden, a sand and gravel operator has found it convenient to build a roadway for trucks, to build a dike around his open storage system, to handle aggregates from stockpile to a hopper feeding a belt conveyor, etc. We know of one operator who, by close regulation of the depth of cut with a Carryall U-12, left just enough overburden so that the first cut with the excavating shovel delivered a gravel with sufficient binder to sell as a stabilized road surfacing material.

In blasting, plant operators are becoming more adept in their use of explosives to get better breakage, but the outstanding single development has probably been the increased use of "safety" explosives. One of these safety agents, "Nitramon", which we have observed in practice, is not explosive in itself but requires a special primer or a large primer of dynamite to initiate the detonation. This blasting agent was developed mainly for use in well-drill blast holes, and when used with Cordeau is said to be one of the safest blasting combinations in present use.

In excavating sand and gravel and crushed stone, we have observed an increasing number of light, fast-moving shovels, particularly in the medium size plants, with capacities up to 200 tons per hour. These machines are proving very efficient and are sufficiently mobile to be readily adapted to utility work around the plant.

The trend in delivering materials from the pit or quarry to the crusher is evidently along two lines—the skip, or the quarry bucket carried as a truck or trailer, and the greater use of trucks. The quarry buckets of the type manufactured by Dempster Brothers, Inc., Knoxville, Tenn., are finding increasing application in small quarries and in others, where selective quarrying of stone is desirable. These buckets are generally of about 1 to 1½-ton capacity, and are readily "spotted" and delivered to the crusher. Dempster Bros., Inc., has sold more than twice as many of these units in 1937 as in the two previous years.

For trucking of stone to the crusher, heavy loads are being handled successfully, using Ford trucks and 10 cu. yd. Easton semi-trailers at the quarry of the Raleigh Granite Co., Raleigh, N. C. Similar trailers have just been placed at the Rock Hill, Penn., quarry of the General Crushed Stone Co. The application of this type of hauling unit will be described later in ROCK PRODUCTS.



Above, left: Ford trucks with semi-trailor Easton bodies of 10-cu. yd. capacity hauling rock at Rock Hill, Penn., plant of General Crushed Stone Co. Center, left: Bringing down 100,000 tons of well-broken rock at the North Branford, Conn., plant of the New Haven Trap Rock Co. using 20,250 lb. of Hercules powder. In the photograph, the face has just begun to collapse after the toe had moved out. Lower left: Action shot of a Cleveland wagon drill, a type of drilling equipment which is gaining wide acceptance. Upper right: Metropolitan Construction Co., Denver, Colo., is excavating and delivering sand and gravel direct to a hopper feeding a belt conveyor, with a LeTourneau 8-cu. yd. Carryall powered by a 40-hp. Caterpillar Diesel tractor. Lower right: P.&H. ½-cu. yd. shovel feeding Lippmann conveyor in pit of Hartland-Verona Gravel Co., Verona, Wis.

Some Points to be Considered in

UNION LABOR CONTRACTS

Discussed by V. P. AHEARN

Executive Secretary, National Sand and Gravel Association

PROBABLY few if any trade association executives are better qualified to discuss labor relations than V. P. Ahearn, executive secretary of the National Sand and Gravel Association, and the National Ready Mixed Concrete Association and the National Industrial Sand Association. His education in law, his early experience as a U. S. Senator's secretary, and his many years' intimate acquaintance with the problems of his member companies, not to mention his philosophical as well as practical type of mind, admirably fit him for helping in the solution of one of industry's most vital problems. From his various letters and talks to his member companies, we have gathered the following helpful ideas, suggestions and advice.

His activity in labor relationships, briefly summarized, has consisted in first giving member companies a practical summary of their legal obligations in respect to collective bargaining with their employes or representatives of their employes, supplemented by a presentation of the strictly practical questions which cannot be divorced from any effort to assist them in the handling of labor questions.

This industry is peculiarly vulnerable in respect to boycotts, and often employers have been told that unless they accept the closed shop, their materials will not be used by union labor. In many cases such a boycott will effectively close a plant, and where the boycott is successful or shows its potentialities for stopping production, employers have been forced to compel their employes to join the union. It is not infrequently the case that the business representatives of unions have no contact at all with the employes at plants, the activity of the union being confined exclusively to a demand upon the employer backed by the threat of boycott. This particular kind of coercion has been successful in a number of instances.

So far, employers in the main, whenever union organization has been accomplished, have signed contracts with the horizontal unions composing the American Federation of Labor. It is obvious that this development is responsive to the circumstance that the Building Trades Councils are local federations of horizontal unions, but if the C. I. O. should ever succeed in setting up rival councils in the important cities, employers will have a much more severe problem with which to deal, because it is enmeshed in questions of jurisdiction.

Sample Contract

A contract signed by a member company is analyzed and criticized as follows:

ARTICLE I

Object

Because both Companies and Unions desire to establish a relationship of cooperation whereby the mutual interests of both may be promoted to the highest degree of efficiency in the Sand and Gravel, Stone, Building Materials, and Ready Mixed Concrete industries; stabilize employment, agree upon wage rates and conditions of employment, and do away with strikes, boycotts, lockouts and stoppage of work; it is agreed that Companies will employ only Engineers who are members in good standing of International Union of Operating Engineers Locals Nos. ....., and laborers who are members in good standing of Hod Carriers, Building and Construction Laborers Local No. .....; that regulations will be observed to discipline those who may be guilty of conduct unbecoming an Engineer or Union Laborer; that Companies and their products will be advertised through the usual channels as being fair to Union labor, and that the Unions will use their good offices on behalf of the Companies in every honorable manner.

ARTICLE II

Union Recognition

The Unions are recognized as the collective bargaining agency for those employes of the Companies who are members of the Unions. Present employes shall have the right to become members of the Unions without interference, restraint, or coercion, direct or indirect, by either party to this agreement.

V. P. Ahearn, executive secretary, National Sand and Gravel Association

Companies shall not collect dues or initiation fees for Unions and shall not in any way act as the agent of the Unions. The Unions will not interfere with the Companies' employes during working hours except that the Business Representative may consult with men on the job when necessary, at no time exceeding a period of ten minutes.

Comment: Article I of the enclosed contract is extraneous phraseology without any real purpose. It is not overlooked, of course, that this Article effectively establishes the closed shop, although Article II seems to deny that purpose. It is believed, however, that the principal purpose of Article II is to protect the right of present employes of the company to join the union, thus restraining the union from demanding of the company that all old employes be discharged and that men be used who are selected by the union.

It is important, in respect to the closed shop issue, to recall that the contracts signed by the automobile and steel industries contained a specific prohibition against the closed shop, the companies in each case agreeing to recognize the union only to the extent that it represented employes. When the closed shop demand is supported by a potentially effective boycott, employers in an industry may have little if any choice, but the closed shop should be seen to be what it really is—the most oppressive form of private monopoly which requires a man anxious to work to take out a license with the union before he can earn his livelihood. The closed shop clothes the union with the authority of life and death over employes; it exposes them to the necessity of paying dues and assessments without end and it places them at the mercy of a capricious and arbitrary union official. An industry, in the light of these conditions, should not accept a closed shop in any instances without the most mature consideration.

ARTICLE III

Company Management

The Companies specifically reserve the right to sell and service any and all of their customers at any and all times at the Companies' discretion, and the Unions specifically agree to the above, and further agree that at no time during the life of this contract will they (the Unions) interfere, restrain, or coerce, directly or indirectly, the Companies or any of their customers in any manner to prevent the Companies' doing business in their usual way.

In all cases, and at all times, the Companies reserve the right to select the man

best skilled for the particular work, and the right to use their judgment in this selection; and the Companies also reserve the right to promote or demote men employed in one classification of work to a classification carrying a higher or lower rate of pay when in the judgment of the Companies, upon one hand the qualifications of the employe are satisfactory and the employe has earned his right to promotion, and upon the other hand the circumstances justify demotion or discharge.

It is distinctly understood and agreed by the Unions that the officers of the Companies reserve the right of management at all times, and that they may select in case of reduction of forces, those members of the Unions who are in their estimation the best qualified to continue during said reduction of forces. The Companies also reserve the right and the Unions hereby expressly agree, of making such addition in forces as they see fit, as additional forces are put back to work.

Comment: Article III is highly commended. It is unfortunate that other contracts signed by member companies have not contained this same control over company management.

ARTICLE IV

Compensation Insurance

Companies agree to carry workmen's compensation insurance for the protection of their employes.

Comment: Only two States (Arkansas and Mississippi) fail to provide a workmens compensation insurance. Since compliance with the law is not discretionary, there is no reason for writing into labor agreements a provision such as Article IV.

ARTICLE V

Working Hours and Rules

The maximum number of hours any employe (i.e., all employes of the Companies other than clerks, timekeepers, watchmen, foremen, superintendents, truck mechanics, and office employes) may work at the rate of compensation herein established, shall be forty-eight (48) hours per week, and not in excess of eight (8) hours in any one day. The Companies reserve the right to control the starting time of the work day of their employes.

Employes shall receive one and one-half (1½) times the regular rate of compensation herein established for all time worked in excess of the maximum daily hours herein provided excepting that they shall receive one and one-half (1½) times the regular rate of compensation, Labor Day excepted, for production or delivery work on Sundays and legal holidays. The observed legal holidays shall be: New Year's Day, Decoration Day, July 4th, Labor Day, Thanksgiving Day, and Christmas Day.

No weekly, monthly, or yearly employe of Companies who is a member of the Unions shall lose time because of the legal holidays listed above, and when required to work on any of those holidays, shall be paid one and one-half (1½) times the usual scale of wages as herein agreed. All labor performed by members of Unions on Sundays and in excess of 48 hours a week shall be paid for at one and one-half (1½) times the established scale rate.

The Companies specifically require and the Unions agree that at all times the members of the Unions who are operating equipment for said Companies will make all necessary maintenance repairs, grease said equipment in the morning, fill gas tanks, and have machines ready to operate at starting time, at no additional cost to said Companies. Emergency repairs shall be paid for on the regular scheduled rates of pay and not on an overtime basis.

Comment: There are three things which distinguish the sand and gravel industry in this regard: (1) highly seasonal characteristics of the business; (2) peak-load variations; (3) interruption due to adverse weather conditions. Therefore, a variable program for controlling hours of employment is indispensable, and a daily limitation should be avoided at all cost. At the very least, there should be a maximum work week, without daily limitations, say of 48 hours. In fact, the control might well provide for a maximum work month, and a figure of about 200 hours is suggested. This will give the regular employes the maximum amount of total wages and will not require the company to deprive old employes of full-time employment in order to make room for new men without any previous stake in the company.

Article V provides for a daily as well as for a weekly limitation, but the unions would not yield in their insistence upon a provision for daily control. Other parts of Article V are commended to member companies, except that the provision for time and one-half goes beyond the NRA Code stipulation, which was for time and one-third for all hours worked in excess of a weekly limitation.

ARTICLE VI

Apprentices

In order to maintain a sufficient number of skilled mechanics in the industries covered by this agreement, the necessity for the employment of apprentices is hereby recognized and the employment and proper training of as many apprentices as is reasonable and practicable shall be encouraged and undertaken by the Companies and the Unions. Firemen, Oilers, and Helpers under proper supervision of the engineers and under the instructions of the Unions are and shall be the apprentices and they shall be given an opportunity by Companies to operate under the supervision of the engineer whenever time and opportunity avail. An apprentice who is being employed on operator's or engineer's work for the Companies shall receive the apprentice scale of wages herein set forth for such work.

Comment: Article VI covers a very critical point in any industry, namely, the training of apprentices.

ARTICLE VII

Rates of Pay

The rate of wages to be paid by the Companies to members of the Unions employed by them shall be as follows:

For operators of shovels and shovel-rigged equipment irrespective of their motive power, hoe type, crane type, dragline type, dipper-stick type, Monahan machine and derricks, locomotive cranes, and all dredges, the rate of wages shall be:

$ 1.25 an hour on the day pay basis
54.00 a week on a weekly basis
52.50 a week on a monthly basis
51.00 a week on a yearly basis

For operators of all portable and hoisting engines, concrete mixers and mixing plants, air compressors, cable ways, clamshell buckets, truck cranes, pile drivers, locomotives, rollers, back fillers, trench machines, connecting machines, and all other types of cranes, caterpillar tractors of over 30 horsepower, blade machines, and bulldozers irrespective of their motive power or size, and pumps having a discharge of four inches or more, the rate of wages shall be:

$ 1.00 an hour on the day pay basis
43.00 a week on a weekly basis
41.00 a week on a monthly basis
38.50 a week on a yearly basis

Firemen, oilers, and helpers on all equipment of one-half cubic yard or over shall receive the following rate of wages:

$ 0.85 an hour on the day pay basis
36.00 a week on a weekly, monthly, or yearly basis

Getting up steam and greasing up in the morning, filling gas tanks and making machine ready for operation at starting time is the fireman's and oiler's work and is included in this rate.

For Pit labor, crusher feeders, elevator pit men, warehouse labor, scale floormen, cement car unloaders, teamsters (fresno and/or slip work), the rate of wages shall be:

$ 0.62½ an hour on the hourly pay basis
28.00 a week on a weekly basis
26.50 a week on a monthly basis
25.50 a week on a yearly basis

The Unions specifically agree that during the life of this agreement none of their members will accept employment from any other employer at a lower rate of pay for similar work or under a different schedule of working hours than herein established; and in the event of a general decline in the wages of labor or hours of work, the Companies will immediately benefit from such decline.

Comment: The rates of pay provided for in Article VII seem unduly high in comparison with the prices prevailing in other localities. They are probably as high as any scale in this industry in the country, notwithstanding the fact that the city in which the member company is located is not grouped among the cities ordinarily held to represent the highest cost of living.

ARTICLE VIII

Payment of Wages

The Companies shall make all payment of wages due in lawful currency, or by negotiable check therefor, payable on demand. Wages and salaries of employes shall be paid at least twice a month.

The Companies agree that if at any time they pay a member of the Unions with a check and do not have sufficient funds in the bank to meet said check, this shall constitute cause of stoppage of work upon the information's being transmitted to the Union's representative, and that there shall be no resumption of work until a sum not less than the expense incurred in collecting the amount due and the full amount of the check involved have been paid. Such failure to have sufficient funds for payment of check when presented shall constitute forfeiture of further right of Companies to pay by check to Unions' members employed by them.

Any employe who quits or is discharged shall be paid in full. No employe shall leave the job by quitting unless the Unions have properly relieved him by another qualified member of the Unions.

Comment: Article VIII seems, on first glance, to be totally unwarranted, particularly since there are appropriate State laws to cover the issuance of checks without sufficient funds on deposit. However, it is understood that union members in that locality in question have had unsatisfactory experience with other companies in respect to collecting their wages when they are paid by check. Article VIII is then held by the unions to be necessary and without any reflection on the company signing the contract.

ARTICLE IX
Employment

Any employe member of the Unions requiring relief for sickness or other just cause must secure such relief through and with the aid of the office of the Unions. The Companies shall have the right to select such relief employes from among those members of the Unions unemployed and registered in the Unions' offices.

Whenever the Unions fail to furnish a sufficient number of competent men affiliated with the Unions to meet the needs of the Companies, the Companies shall hire such additional men as may be required to meet their needs, regardless of their affiliation or non-affiliation with the Unions. It is distinctly understood and agreed by the Unions that such additional employes shall be allowed to work without interference, restraint, coercion, or molestation by any member of any Union affiliated with the American Federation of Labor, and that they shall not be required to join a Union or pay dues, assessments, or permit fees to any Union. Such additional employes shall be released at the end of the day's work following the Unions' furnishing the number of qualified men required by the Companies. The Unions agree to maintain an office with telephone service available from the hours of 8 a. m. to 5 p. m. to meet the above requirements, and in addition to give night telephone numbers of all Business Agents with whom Union members are registered, so that in case of emergency the Companies may contact same during the evening or night. Failure of the Companies to call the office or officers of the Union does not permit the placing of non-union men on work under this clause.

Comment: Article IX is typical and seems to require no special comment.

ARTICLE X
Disputes

Should any dispute arise during the period of this Agreement as to the performance in good faith of this Agreement which cannot be settled by the Company concerned and the representatives of the Unions, the matter shall be referred to a joint committee consisting of six members, three to be appointed by the Company, and three to be appointed by the Unions. If the joint committee fails to effect a satisfactory settlement by a five-to-one approval, the matter shall be settled by arbitration, three representatives of the Companies to appoint a party not a member of the Companies and the Unions to appoint a party not a member of the Unions, and the two parties so appointed to select a third party not a member of the Companies or the Unions, which shall constitute a Board of Arbitration, the expense of which shall be assumed equally by the Company and the Union. In the event the two parties cannot agree upon the third party, a Federal Judge presiding in the vicinity where such controversy occurs shall be requested to appoint the third member. The Board of three thus constituted shall consider the complaint and render its decision within fifteen (15) days by a majority vote, such decision to be final. Pending the settlement of all differences and disputes in the above manner there shall be no strikes, lockouts, or suspension of work on account of any such difference or dispute.

ARTICLE XI
Jurisdictional Disputes

Union engineers and apprentices shall be employed on all of the Companies' equipment irrespective of motive power, and it is specifically understood and agreed by the Companies and the Unions that all jurisdictional disputes shall be settled by the National Board of Jurisdictional Awards, whose decision shall be final.

ARTICLE XII
Duration of Contract

This agreement shall remain in full force and effect until December 31, 1937, with the option of the Companies to renew upon authority of their Board of Directors; and thereafter from year to year until terminated at the option of either party after three months' written notice.

ARTICLE XIII
Effective Date

This Agreement shall be effective when signed by the Companies hereinbefore mentioned and the duly appointed and elected officials of the Unions and shall remain in effect as provided in Article XII. It is further provided that this Agreement may be changed or altered at any time by the mutual consent of the Companies and the Unions.

Comment: Article X is recommended as a reasonably safe means of avoiding violent disputes, and Article XI, Article XII, and Article XIII are repetitions of similar provisions in the majority of contracts signed with craft unions.

Interpretation of the Wagner Labor Disputes Act

A series of questions bearing upon important points under the Wagner Labor Disputes Act were prepared by an industrial group interested in clarification of the meaning of the law. Those questions were discussed informally and unofficially in Administration circles, and answers were obtained which are believed to be reliable.

Q. Is an employer required to bargain with the representatives of employes prior to a determination by the Board that they represent a majority?

A. The law requires the employer to bargain with representatives of the majority of his employes whether the fact has been determined by the Board or not. If such representatives do in fact represent a minority he would not be violating this requirement by refusing to bargain with them, but he might be in conflict with the provision forbidding interference with organization.

Q. Must an election be held in every case before the Board can ordain which are the representatives of the majority?

A. No. The Board may determine who represents the majority upon any adequate proof, and an election is merely one convenient method.

Q. Where no election has been held, but it is understood that an organization represents a majority of all the employes, is the employer required to bargain also with representatives of minority groups who may represent majorities in a particular craft or unit?

A. The law requires the employer to bargain with the representatives of the majority of the appropriate bargaining unit which may be "the employer unit, craft unit, plant unit subdivision thereof." In a particular case, if the plant as a whole was the proper unit the employer might refuse to bargain with the majority of a craft in that unit, but if the proper unit was the craft, then he would violate the law in refusing to bargain with a majority of the craft. The employer's only alternative is to indicate willingness to do whatever is right and leave it to conflicting groups to obtain jurisdictional authority from the Board.

Q. May an employer who has bargained in good faith even to the point of entering into a signed agreement with a labor organization representing employes, refuse to deal further with such organization when the contract has been broken by members of that organization—

(a) When the organization has not been officially designated by the Board as representative of the majority?

(b) When it has been so designated by the Board after an election or otherwise?

A. Breach of agreement does not relieve the employer of his obligations under the Act in either case. He has other rights and remedies which he can resort to.

Q. Are signed agreements necessary?

A. Signed agreements are not required by the Act. (Speaking as an individual and not officially, the spokesman stated he could see no reason why, if an agreement was reached, it should not be reduced to writing and signed.)

Q. Must the employer bargain on any demand, regardless of scope presented by the employes?

A. Section 9(a) of the Act states that representatives of the majority of the employes shall be the exclusive representatives of all the employes in the unit "for the purposes of collective bargaining in respect to rates of pay, wages, hours of employment, or other conditions of employment." The employer is not required to bargain concerning a matter which is not "a condition of employment."

Q. To what extent will the National Labor Relations Board apply the Wagner Act to intrastate commerce?

A. So far the Board has not assumed jurisdiction over any labor dispute unless there is a clear showing in the specific case that at least a percentage of the products of the company move across State lines in interstate commerce. That percentage need not be a majority of the shipments; indeed, it may be only a small fraction. If a given company ships only in intrastate commerce, even though it competes in State markets with companies shipping in interstate commerce, the chances are that the Board, for the present at least, will not apply its powers. The Wagner Act is necessarily predicated upon the commerce clause of the Constitution, and the Board has plenty to do only with purely interstate business before expanding its authority to questionable cases. However, this answer should be taken to mean that the Board is disavowing jurisdiction over certain kinds of intrastate commerce. It will be governed entirely by developments.

Search For New Markets To

SELL at a GOOD PROFIT

By R. S. TORGERSON

"IS MY BUSINESS PROFITABLE?" is the question which must be answered whether it is an individual, a partnership or a corporation. When the accounts are balanced at the end of the year, the profit is often so small that it is wondered whether the work and worry are worth the candle.

Producers in the rock products' industry are not an exception to this situation. There may be some cases where, by reason of floods and other natural catastrophies, the small profit or loss may be easily explained, but generally the answer goes back of these accidental reasons. What may be the cause? Is there inefficiency in production; is the product in sufficient demand; is the sales promotion effective?

Improvements in machinery and methods are constantly increasing productive efficiency so that while there is a lag in modernization to catch up with the latest practices and equipment, most producers will agree that the failure of a business to make profits cannot be attributed to this cause.

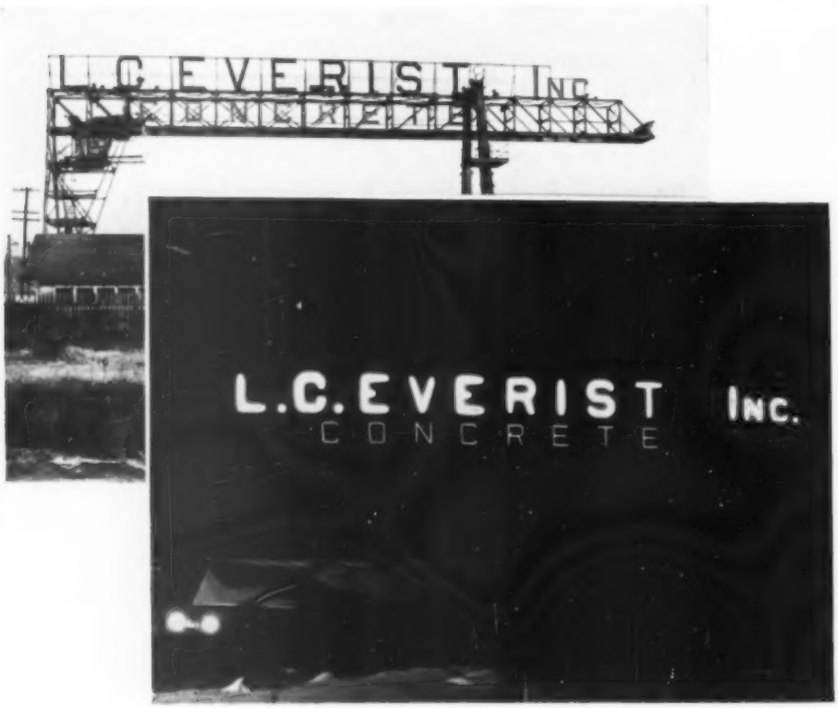
Generally speaking, the rock products industry has not been distinguished for its sales methods or its activities in the direction of market research with one exception, the portland cement industry. The portland cement industry, through the Portland Cement Association, has done an excellent job of sales promotion, and plans are now being formulated to broaden the national advertising program so that the public in *every* walk of life will be made conscious of the importance of cement and concrete. While all general advertising is handled through the P.C.A., individual cement companies have advertised special products; such as, high early strength cement, white portland cement, cement paints, etc. In addition to the literature on various uses of cement prepared by the P.C.A., many of the cement companies distribute booklets of their own, generally promoting the use of a special cement. Some excellent house organs also are printed for distribution to retailers and other large buyers. These house organs primarily serve to bring a personal touch to the companies' relations with their customers. Very few cement companies maintain separate service organizations, but every salesman is trained to provide customers with information regarding the use of cement and aggregates. One cement manufacturer on the Pacific Coast, however, has set up a special service organization whose primary function is to work out engineering and other problems involving the use of cement.

Some interesting national advertising has been done by the National Lime Association on the uses of lime in engineering, water supply treatment, and industrial work, which has attracted considerable attention. A few individual lime producers have distributed attractive literature, describing and illustrating the manufacture of lime from the quarry to the finished product, interesting uses which are made of lime, and recommended mixtures for various plasters.

Ready-mix concrete producers have become more active in sales promotion work, employing advertising mediums, such as newspapers, radio broadcast, and large electric signs.

Concrete products manufacturers have been fortunate in having the support of the P.C.A. in the preparation of copy for local advertising campaigns. This stimulus has resulted in the launching of advertising schedules in local newspapers by many progressive companies, and has brought about a diversification of products to widen markets. Another effective way of promoting the use of concrete products has been the construction of model homes; in some cases manufacturers in a city have pooled their resources in building these homes for public display.

Sand, gravel, crushed stone and slag producers probably have been the least active in sales promotion work, but demands for material which must meet rigid specifications are beginning to make this industry aware of the fact that it is selling products having distinctive qualities; and that they can be sold on merit. An encouraging trend toward a broadening of the market is the work of the National Associations in furthering research devoted to finding new uses. As evidence that individual operators are recognizing the value of sales promotion, one large Middle West producer has distributed



Large Neon sign of L. C. Everist, Inc., Sioux City, Iowa, located on the company's bridge crane, promotes the sale of ready-mix concrete, aggregates, cement, and other products. It is a blinking sign with the large letters 8 ft. high and 6 ft. wide.

attractive two-color blotters and folders, illustrating the plant equipment and different operations and listing the uses and classifications of sand and gravel.

Stabilized Roads Offer New Market

Stabilized road construction has opened up a new market for sand and gravel, crushed stone, slag, and cement producers. Plants for mixing aggregates and the binder have been established either as part of the equipment of the sand and gravel or crushed stone operator or in co-operation with an independent highway construction company as an outlet for the aggregates producer. The mixes are often sold under a special trade name.

Various binders are used in making stabilized road mixes. An interesting Swiss development, invented by Dr. Albert Sommer of Zurich, is now being introduced in this country and it is expected to provide a new market for very fine stone screenings. Dr. Sommer precipitates bitumen on finely powdered minerals by atomization in a state of such dispersion that the pulverent form remains unchanged. Both components, dust and bitumen, are carried and suspended in compressed air, forming clouds which are intermingled by pneumatic action. The resulting bituminous filler, when mixed with the proper proportion of stone aggregates, is said to make a road which does not show deformation by internal movements, and bitumen cannot rise to the surface, as free and fusible pitch.

Cement is taking a prominent place as a binder for stabilized road construction. The South Carolina Highway department is credited as the pioneer in the use of this type of construction. Experimental projects have been built in Michigan, Wisconsin, Missouri, and Illinois. The Portland Cement Association has co-operated in building these test roads to determine the possibilities of cement as a binder. Careful analysis of the soils are made to determine the quantity of cement necessary in the mix. Cement manufacturers expect this to develop into a 20,000,000 bbl. annual market.

Other binders used in stabilized road mixes include calcium chloride, sodium chloride, and Raylig, a lignin liquor residue from the manufacture of rayon and wood pulp. Raylig is being used in the Pacific Northwest as a dust palliative and binder for stabilizing crushed stone and gravel roads. Probably everyone is familiar with the calcium chloride road mix plants in Michigan and other States.

A growing market for sand and gravel and crushed stone operators exists in the production of products outside the construction and highway fields. Water filtration, chicken grit and canary bird grit, take increasing quantities of special sands and crushed stone sizes. Limestone flour is used extensively as an animal food ingredient—and also as a filler in a variety of products.

Samples of advertising, direct mail folders, blotter, and house organ. This advertising and trade literature have been very effective in stimulating sales and creating good-will between producers and customers

New Uses for Industrial Sands

Perhaps one of the most interesting markets for rock products is in industrial sands. In addition to the more commonly known uses for industrial sands or silica; such as, moulding sand, abrasives, refractories, an almost limitless field of industrial and chemical uses is being found for silica flour of various degrees of fineness. Silica flour of the best quality tests over 99 percent silica with only minute quantities of iron oxide, aluminum oxide, calcium oxide, magnesium oxide, and titanium oxide. Finely pulverized silica sand or flour is becoming the major production of some companies.

The uses of silica flour are constantly growing as research reveals its advantages for different purposes. In the preparation of enamels for application to metal, silica flour is used as a constituent and as a partial substitute for feldspar. Silica flour also is used as a glaze applied to chinaware and pottery. Ground sand is used as one of the ingredients of match heads. Very finely ground silica, 94.5 percent passing 325 mesh, is used as a pigment in paints, some of which contain as much as 30 percent of this material. Chemical and electrical porcelain, floor and wall tiles contain up to 35 percent of silica flour which is ground to pass 120 mesh. Silica flour, free from iron oxide and passing 200 mesh, is used as an acid-resisting filler in hard rubber. Asbestos shingles contain about 40 percent of silica flour passing 200 mesh. Other uses for silica flour include asbestos plaster, roofing material, composition flooring and gypsum plaster and wall board.

Agricultural Limestone and Lime

One of the most promising markets for the limestone producer and lime manufacturer is agriculture. The agricultural conservation program of the Department of Agriculture is expected to give added impetus to the growing use of hydrated lime and agricultural limestone. While no figures are available as to the national requirements for "liming" to meet deficiency in soils, some figures released by Dr. De Turk, of the University of Illinois show the magnitude of the market when he pointed out that 15 million acres in Illinois now need an average of two tons per acre. At present only 1,000,000 tons are being used annually. Iowa has about doubled its use of agricultural limestone, 1,000,000 tons having been used in 1937. The program of the U. S. Department of Agriculture provides compliance payments to farmers who "lime" soils, and it is expected demand from this source will rise very appreciably in 1938. Some quarries are now devoting almost 100 percent of their plant facilities for the production of agricultural limestone.

A Brief Resumé of Trends On

GRINDING IN THE CEMENT INDUSTRY

By NATHAN C. ROCKWOOD

AFTER HALF a century's experience the American portland cement industry is beginning to learn some fundamentals of fine grinding. That is no reflection on the technical men of the industry because they have been kept busy producing cement, searching for ways to reduce costs, and following rapid changes in manufacturing methods in general. They have been too busy to pursue systematically a single line investigation; and there is no other way to learn grinding save by practice and study of it in one's own plant and with one's own materials and equipment.

What we have attempted to present here is hardly an introduction to the subject; but it is a subject we intend to pursue, with the generous help of technical friends in the industry, for some time to come.

Two events have made grinding, for the time being at least, the primary consideration of the cement manufacturer. The first was the introduction of the air separator and the general adoption of closed circuit grinding; the second is the new custom of writing specifications for cement fineness in terms of specific surface requirements.

Air separators have increased the efficiency of all types of mills, when properly used, and will probably be a permanent part of every flow sheet.

Specific surface specifications for fineness may possibly be a passing fad. Among the best informed there is belief that cement can be ground *too fine* for practical use, regardless of apparently well established theory that no cement particle larger than say 25 to 40 microns in size ever completely hydrates. No more will be said here other than to recall the fact that very fine grinding was introduced originally to overcome defects in burning or clinkering practice; and it is quite possible that with improved burning and clinkering practice it may no longer be needed to insure *sound* cements. It may always be necessary for making quick-hardening cements; even that is not established beyond reasonable doubt; and may be quick-hardening cements will not remain popular for every purpose.

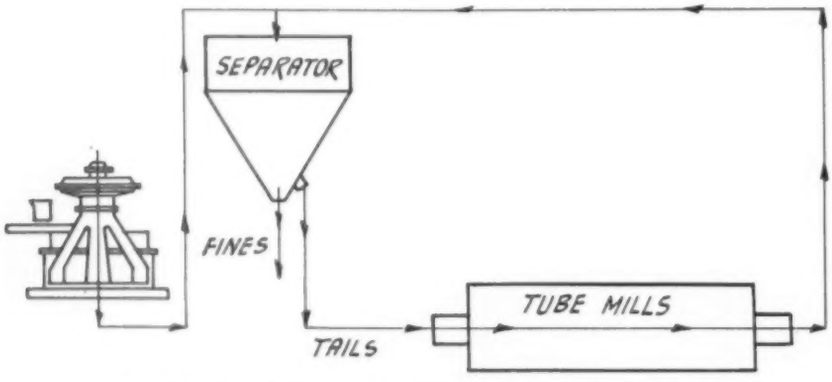


Fig. 1: Common flow sheet for raw material grinding in two stages

Raw Grinding

Grinding of raw materials in closed circuit has become almost universal practice. Fig. 1 shows the ordinary flow-sheet for dry grinding. The sketch shows a Hercules type of mill; for this is a pioneer in the field of preliminary grinders, but of course other types are just as common. A new and novel flow-sheet is Fig. 10. This is the set-up at the rebuilt Hudson, N. Y., plant of the Universal Atlas Cement Co., where a B. & W. mill is close-circuited with an elevator and air separator. Through this whole system hot air is circulated which drys the raw materials as they are ground and conveyed.

In raw grinding it is taken for granted that there is no purpose in grinding finer than 200-mesh. There are cement men who are beginning to question this; we believe with good reason; however, it is now the accepted practice. Therefore, the object is to reduce to 200-mesh as quickly and efficiently as possible.

Ball and tube mills are not generally regarded as efficient crushers. Crushing is best done in one or more preliminary crushers or mills—it usually being done in two or three stages. Some experts say nothing coarser than ¼-in. material should be fed to a ball mill. It is well known that reducing the size of the material fed greatly increases ball and tube mill capacities.

Dust collectors and air separators make possible the saving of fine mate-

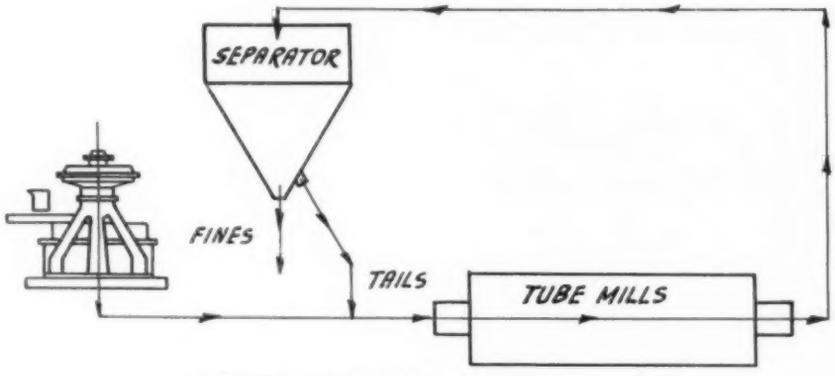


Fig. 2: Common flow sheet for finish grinding in two stages

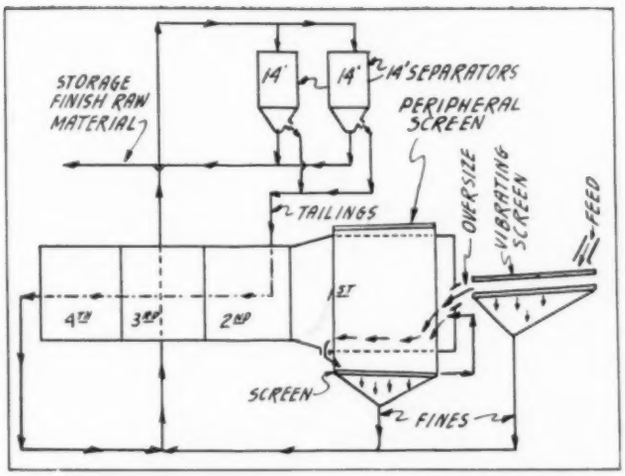


Fig. 9: Raw grinding flow sheet of Waco, Tex., plant of the Universal Atlas Cement Co.

Flow sheets of three Universal Atlas Cement Co. plants are grouped here for comparison

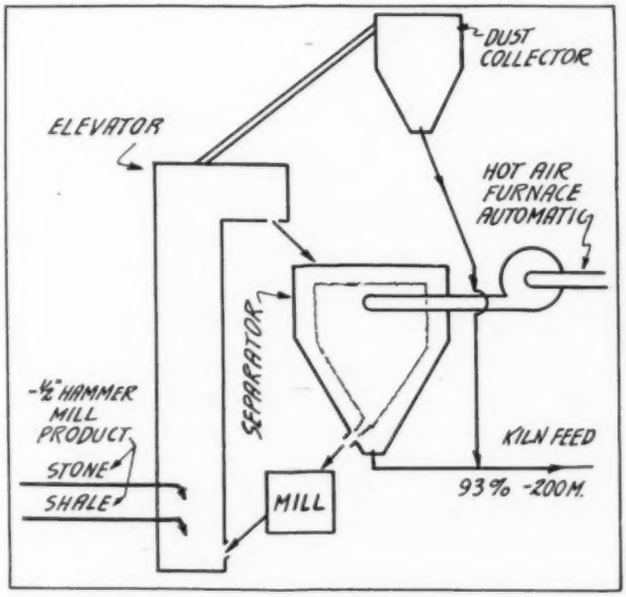


Fig. 10: Raw grinding flow sheet of Hudson, N. Y., plant of the Universal Atlas Cement Co.

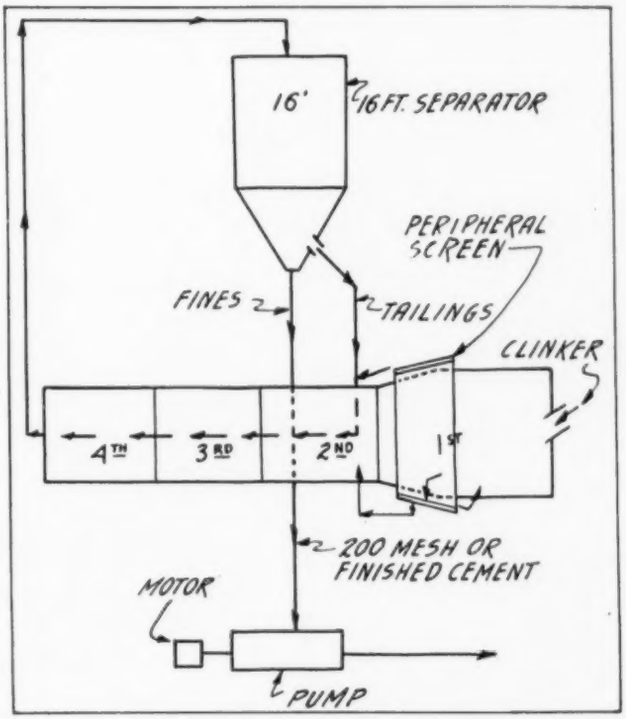


Fig. 11: Finish grinding flow sheet of Waco, Tex., plant of Universal Atlas Cement Co.

rial wherever made without passing all the material through a tube mill. For this purpose very large circulating loads in preliminary mills are often used—are in fact the rule. Here the *efficiency* of the air separator—its ability to skim off 200-mesh material as fast as made—is important. While only experience with particular installations and particular raw materials can develop the best combination, the objective is definite and obtainable.

Wet raw grinding is not discussed here, except to note that the tendency is toward closed-circuit grinding using vibrating screens or some other type of slurry separator. It is notable, however, that increasing efficiency of dry grinding, and present possibilities of perfect dry blending, in which the closed-circuit, mill-air-separator unit is a factor, may reverse the recent trend toward the use of the wet process almost exclusively.

Finish Grinding

In clinker grinding the problem is altogether different. No one today wants uniformly sized cement, no matter what its particle size. The efficiency of the air separator as such is not so important. Its main function is to keep a large and uniform circulating load going through the tube mill. Instead of holding the material in the mill until ground to specification size, whether or not that be 200-mesh, it is given an average of

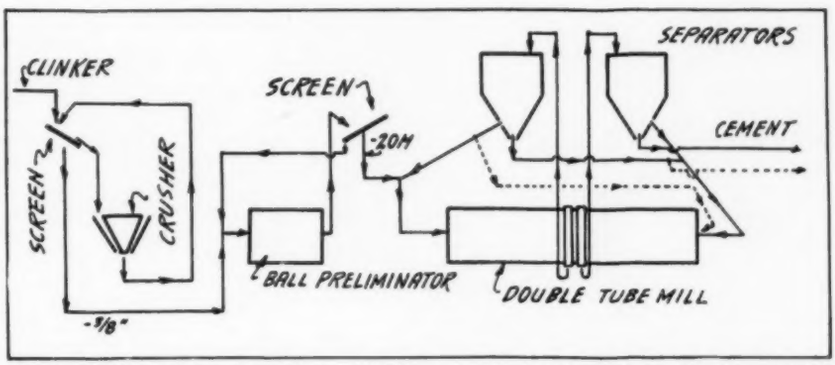


Fig. 12: Finish grinding flow sheet of Hudson and Leeds, Ala., plants of Universal Atlas Cement Co.

two or possibly more passes through the mill. This tends to keep the cement cool, and it keeps the grinding media cleaner and more effective, and it permits selection of more efficient or larger grinding media.

It is not desired to remove all the 200-mesh as fast as made because this would produce a cement without the necessary "flour," and one that would not pass the ordinary specific surface requirements. The mill and air separator unit is not dependent for the efficiency on the separator, as in raw grinding, but on a certain specific surface cement at lowest all around cost. That means manipulation and experimenting with *all* the variables involved.

Since compartment mills introduce additional and unnecessary variables, the tendency is quite definitely away from compartment mills. The simplest present practice and the one most likely to yield useful data for scientific control of grinding is to prepare the clinker in preliminary grinders in one, and often two stages, such as by the use of small high speed gyratory crushers, hammer mills, Hercules mills, etc.; then a preliminary ball mill; the product eventually fed to the finish tube mill being reduced to at least minus 20-mesh. Each crushing unit may or may not be in a closed circuit, but the tube mill is. Fig. 12, which is the flow-sheet of the new finish grinding layout at the rebuilt Hudson, N. Y., and Leeds, Ala., plants of the Universal Atlas Cement Co., is a good example of the latest hookup. Fig. 2 is a popular one, of the simplest kind, although other types of preliminary grinders may be used of course.

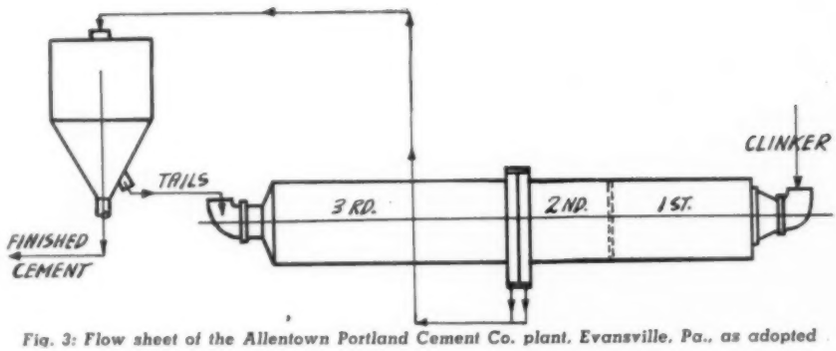
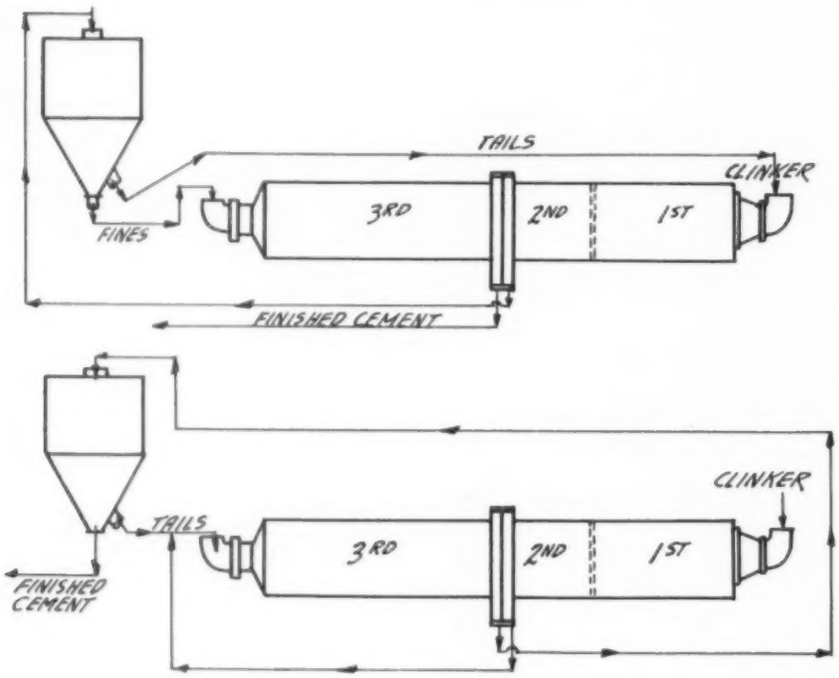


Fig. 3: Flow sheet of the Allentown Portland Cement Co. plant, Evansville, Pa., as adopted

Where a preliminary grinder has its own closed circuit with an air separator, as is the case when a B & W mill is used as the preliminary grinder, the air separator serves the same function as it does in raw grinding. In other words it is so operated as to give maximum efficiency as a separator, the object being, as already noted, to skim off the tube mill feed as fast as produced, returning the tailings to the preliminary mill. In this case very large circulating loads are employed for best efficiency of the entire unit. In this case, moreover, the effect of fineness of feed in increasing the tube mill capacity must be considered and the entire clinker grinding installation balanced for over-all efficiency or lowest power and maintenance cost.



Figs. 4 and 5: Alternative flow sheets considered in connection with Allentown Portland Cement Co. plant

Compartment Mills May Become Obsolete

Compartment mills of the three- and four-compartment, continuous travel type, appear to be definitely on the way out. Figs. 9 and 11 show the latest flow-sheets using four-compartment mills and air separators (at the Waco, Tex., plant, Universal Atlas Cement Co.) for both raw (Fig. 9) and finish grinding (Fig. 11). Air separators were never designed for application to compartment mills; and to differentiate the work done in the various compartments and return the tailings of two or more separators to the correct compartment is too much to expect of any plant operator; so many operators are taking out grids and converting compartment mills to simple tube mills.

The big compartment mill seemed the ideal solution to the grinding problem ten years ago. It combined in one unit all the stages of grinding; required no elevators or other handling equipment between stages; required a minimum of space and headroom and was driven by a single motor. Undoubtedly its compartments and their grinding media could have been adjusted to the particular clinker or raw materials to be ground so as to have served as a very efficient unit. But it had no flexibility in event the materials being ground were not uniform. It could not grind 1100 sq. cm. per gram specific surface and 1750 sq. cm. per gram specific surface with equal efficiency or facility. What it turned out when operating most efficiently may have been good cement, but this is not acceptable under many present-day specifications.

The latest substitute for the older type of compartment mill is shown in Figs. 3, 4, 5, 8 and 12. Figs. 3 and 8 illustrate the flow-sheet and the new F. L. Smidth & Co. mill at the Allentown Portland Cement Co., and Fig. 12 the flow-sheet of the finish grinding units at Hudson and Leeds, already referred to, which include new type Allis-Chalmers finish mills. In both cases the mills have more than one compartment, but they are fed from both ends and discharge near the middle.

In the case of the Smidth mill at Allentown, the clinker is first crushed and ground (with no preliminary crushing) in the first compartment of the mill. The product of the second compartment goes to the air separator, and the tailings from the separator (the circulating load only) to the third compartment, whose product joins that of the second compartment as feed to the separator. Obviously, there are several possible hookups. Two of these are shown in Figs. 4 and 5. That adopted, at least temporarily, is Fig. 3. Alternative hookups of the Universal Atlas mill are shown by dotted lines. Both installations will be described in more detail in later issues, when more data on performances are available.

Summary

Many refinements may be looked for in grinding practice in the next few years as a result of the knowledge it will now be possible to gain from simple closed-circuit units where each factor may be studied separately as to its effect on both efficiency and character of product. Moreover, apparatus is being developed, of which we shall soon hear much, that will provide automatic controls for some of these factors.

Factors which must be studied and controlled are (1) the size, amount and uniformity of the material fed; (2) the amount of moisture (in wet grinding)—there is an optimum for grinding efficiency; (3) the speed of the mill—the higher the speed, within limits, of course, the more crushing action of the balls and the greater capacity; also the more power consumed; (4) the size and quantity of the grinding media; (5) the character of the lining; (6) the amount and size of circulating load.

Segregation of the balls or grinding media according to size is, of course, desirable; that is the chief function of the grids in compartment mills. It has long been accomplished without grids in conical mills; and it is now being accomplished in tube mills by use of a special type of lining developed by C. L. Carman, Independence, Kan., about which more will be said in a later issue. It is mentioned here to show how new refinements may also tend to eliminate the compartment mill.

In conclusion it can be truthfully said that the cement industry still faces the constant hazard of changing ideas on the part of purchasers as to what cement should be, and even as to how it should be made. The cement described in the specifications elsewhere in this issue for the new Catskill Aqueduct for the City of New York would not necessarily require the use of air separators or any such flow-sheets as here described. It could be ground satisfactorily in a standard compartment mill. It can be ground considerably coarser than most recent specifications require. It may be the turning point away from *too finely ground* cements.

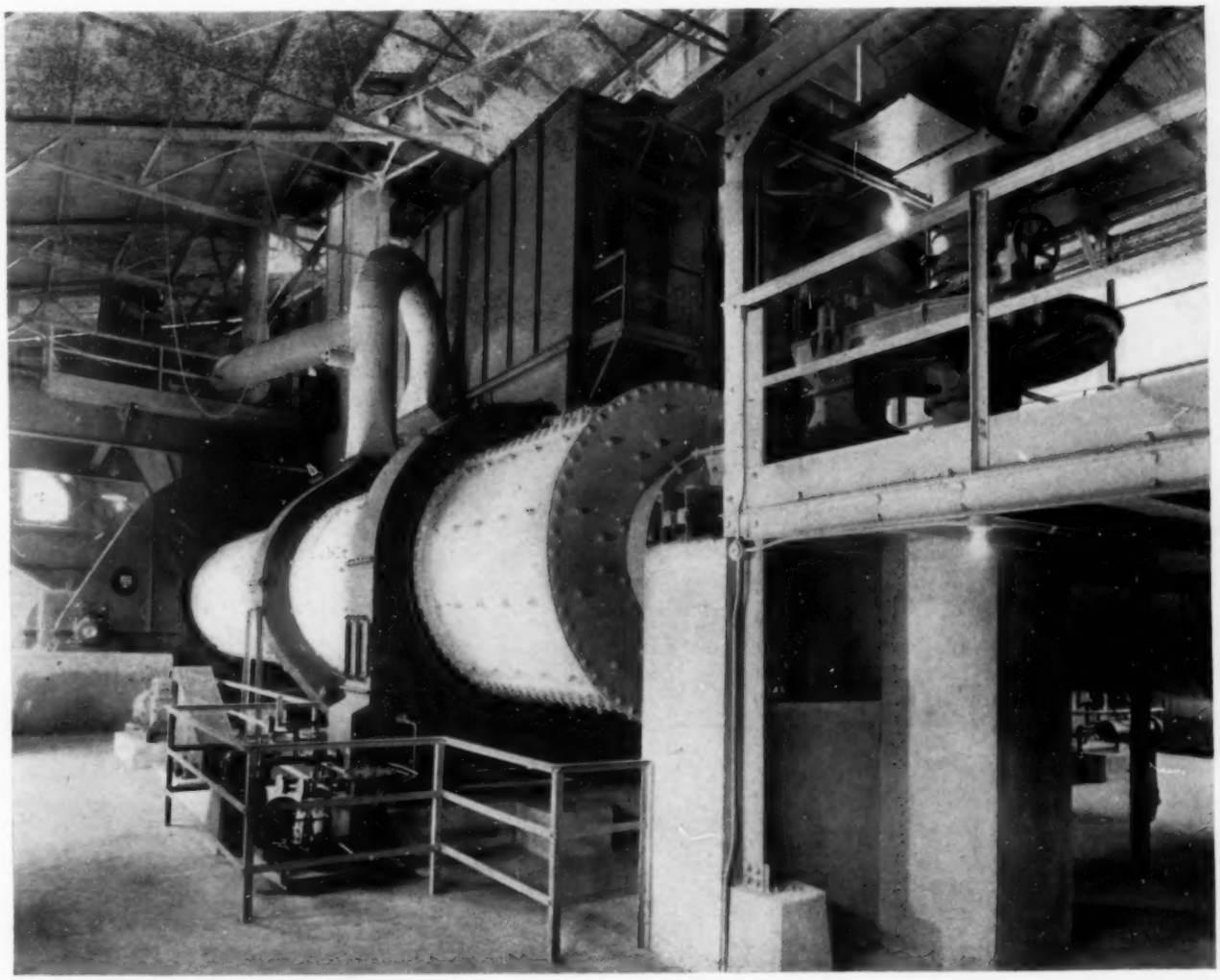


Fig. 8: View of the new mill installation of the Allentown Portland Cement Co. A new type of bearing is a feature, in which through means of oil pressure, the tire actually floats on oil until it starts to rotate, very much reducing the starting torque of the driving motor

Useful Formulas for Wet and Dry Grinding

MEASURING the CIRCULATING LOAD

By FRED C. BOND*

WHEN AN ORE, cement slurry, or any other solid material is ground wet in closed-circuit it is possible to calculate the percentage of the circulating load from the amount of dry feed and water added and the dilutions at various points in the grinding circuit, according to a formula first published in *Mining and Metallurgy*, for November, 1937.[1]

The circulating load is defined as the ratio of the weight of that portion of the mill product which is returned to the mill feed, to the weight of the new feed added to the mill. Both quantities are conveniently expressed in terms of dry tons per hour. The dilution is expressed as parts of liquid to one part of dry solids by weight. It can be obtained from the percent solids, or from the specific gravities of the dry solid and the pulp, by the following well known formula:

Let p = percent solids by weight
s = specific gravity of dry ore
d = specific gravity or pulp

Then

$$\text{Dilution} = \frac{s-d}{s(d-1)} = \left(\frac{1}{p}\right)^{-1} \qquad (1)$$

The quantities required to calculate the circulating load are listed below:

F = Dry tons per hour of new feed to the mill
D = Dilution of mill discharge
S = Dilution of classifier return sand
P = Dilution of classifier overflow
C = Tons per hour of new water added to the classifier
M = Tons per hour of new water added with the mill feed
L = Dry tons per hour of classifier return sand.

All of these quantities except L are measured.

M is the sum of m_1 and m_2, where m_1 is the new water added as liquid to the mill feed, and m_2 is the water contained as moisture in the mill feed.

It is evident that

$$P\,F = C + M \qquad (2)$$

and

$$D(F + L) = M + SL \qquad (3)$$

It follows that

$$L = \frac{M-DF}{D-S} \qquad (4)$$

and

$$L = \frac{PF-C-DF}{D-S} \qquad (5)$$

The percentage of circulating load is

$$\frac{100L}{F}$$

To calculate the percentage of moisture in the new feed to the mill, equation (2) is solved for M, and the amount of new water, m_1, added to the head of the mill is measured in tons per hour. Then

$$\text{Percent Moisture} = \frac{100\,(M-m_1)}{F} \qquad (6)$$

If the percentage of moisture in the mill feed is known, the dry tonnage, F, fed to the mill can be calculated from

$$F = \frac{C + M}{P} \qquad (7)$$

In order to obtain periodic determinations of the amount of the circulating load, measurements of the feed tonnage, dilutions, and water added must be made regularly.

The dilution of the classifier overflow is most conveniently measured by weighing samples of the pulp in a bottle of known weight and volume, and calculating the specific gravity of the pulp, from which the dilution is obtained by formula (1). The specific gravity of the dry mill feed can be determined with a picnometer For cement slurry it should be about 2.69.

The dilution of the classifier return sands, or oversize, is calculated from the percent solids, which is determined by drying a weighed sample. The dilution of the mill discharge can be determined by either of the above methods.

The amounts of water added to the classifier and to the mill feed can be measured, either by installing a flow meter in the water lines, or by diverting the water for a known interval of time and measuring the amount diverted. Only one of these quantities is necessary for the calculation of the circulating load by either equation (4) or (5), but it is preferable to measure both in order to check the result, as well as to check the measured feed tonnage by equation (7).

The following calculation deals with the first stage grinding of cement slurry in closed circuit with a rake classifier, and will serve as an example:

Let
$F = 50.00$
$D = 0.333$ (75% Solids)
$S = 0.177$ (85% Solids)
$P = 1.500$ (40% Solids)
$C = 8.49$
$M = 66.51$
$m_1 = 65.01$

From equation (4) or (5) L equals 319.5 dry tons per hour, and the circulating load is 639%.

From equation (6) the moisture in the feed is 3.00%.

Dry Grinding

In dry grinding in closed-circuit with an air separator the circulating load is ordinarily calculated from screen analyses of the mill discharge; return product, or separator oversize; and finished product, or separator undersize. When the percent passing 200 mesh is determined for these three products the calculation is made by the following formula:

Let
g = Percent minus 200 mesh in mill discharge
r = Percent minus 200 mesh in separator oversize returned
u = Percent minus 200 mesh finished product, or undersize

Then
Percent circulating

$$\text{load} = 100\left(\frac{u-g}{g-r}\right) \qquad (8)$$

Any other convenient mesh size may be used in place of 200, provided, of course, that the same mesh size is used for all three products. When the products are sufficiently coarse so that separations can be made at several different mesh sizes, the circulating load calculated from the percent passing any one mesh can be checked by calculations from the results at other meshes.

It is preferable to use one sieve for all three determinations, since variations between different sieves will cause errors in the result. However, if one sieve is used throughout it may vary considerably from its nominal mesh size without affecting the accuracy of the calculated circulating load.

The following calculation will serve as an example of the method:

Let
$g = 76.4\%$ passing 200 mesh
$r = 61.4\%$ passing 200 mesh
$u = 97.5\%$ passing 200 mesh

Then from formula (8) the circulating load is 140.7 percent.

*Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

[1] Fred C. Bond: "Determination of the Circulating Load in a Wet Closed-Circuit Grinding System," "Mining and Metallurgy," Vol. 18, No. 371, Nov., 1937.

Latest Developments In

CRUSHING METHODS and EQUIPMENT

By BROR NORDBERG

CRUSHING PRACTICES in the stone industry are being influenced not only by rigid specifications but by market requirements which demand a greater number of smaller size products and accurate gradations thereof. Other than regular stone products, agricultural limestone and stone sand have each offered a separate crushing problem; and the manufacture of these special products is rapidly becoming more widespread.

The overall effect on the industry has been a tendency to have a greater number of crushing units for greater flexibility in producing the various sizes and gradations of stone. Where one reduction crusher was sufficient a few years ago it is common to see two or three being used to further reduce stone sizes which formerly were stored in bins for shipment. Generally speaking, there has been no definite trend in the selection of types of crushers unless it be toward the use of double roll crushers where a reduction of 1:2 or 1:3 is desirable with a comparatively small feed (1½ in. or under). The applications of these crushers will be discussed later in this article.

Tonnages of agricultural stone produced annually are steadily on the increase, and a number of concerns are now largely dependent upon the farm market as a sales outlet. We cannot say definitely that there has been shown a preference toward any one crusher type for producing this product. Many companies are successfully producing agstone as a by-product of commercial stone and thus utilizing all the fines from crushing.

In large stone plants producing agstone on a commercial scale, the general practice apparently is to use a type of crusher, such as the hammer mill, which has the ability to take large stone and reduce it to desired fineness in one operation. This is logically the economical practice inasmuch as the shape of the particles is not of greatest importance.

Manufacturing Stone Sand

Stone sand is being manufactured as a by-product in a number of plants; but practices and types of crushers used are by no means uniform. Harshness of the resultant sand is the factor which it is most desirable to eliminate in order that stone sand might take its place along with natural sand as the fine aggregate in concrete. To offset the effects of harshness and make a more workable concrete, contractors usually add an excess of water; and the finished concrete suffers in strength and durability as a result of the excess water rather than from the character of the sand.

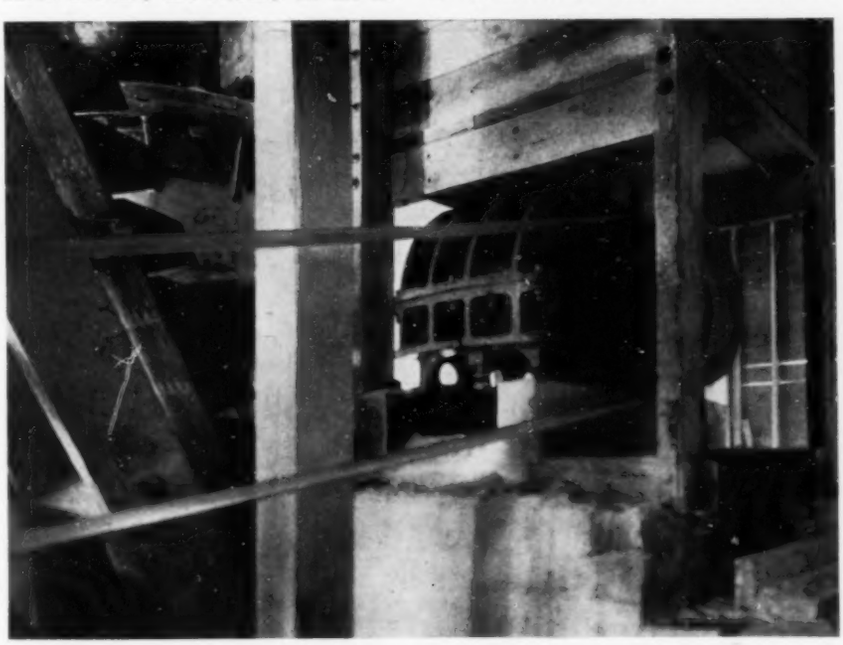
The elimination of harshness is in the particle shapes, of course, and is a problem of proper crushing. Recently there has been completed installation of special equipment at the Radford Limestone Co., East Radford, Va., for the manufacture of dolomite sand, which apparently is instrumental in producing very satisfactorily-shaped grains.

This crushing plant is rated at 2000 tons per day of coarse aggregates and is producing 500 tons of graded dolomite sand per day. The plant is producing aggregates for construction of the Claytor dam across the New river near the quarry. In addition to the coarse aggregates, 150,000 tons of sand are to be produced with a grading of 95 percent through the No. 4-mesh, 60 to 75 percent minus the No. 16-mesh and 15 percent through the No. 100-mesh.

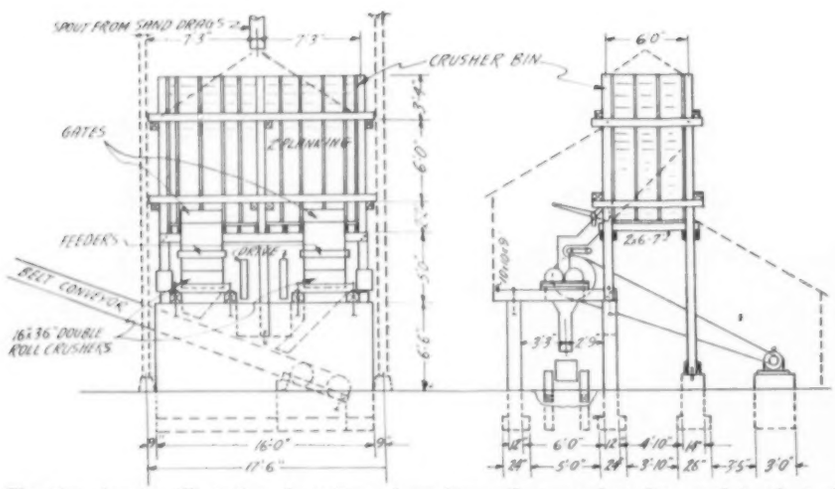
Machinery installed specifically for the manufacture of this sand, after some experimentation, includes a No. 7 Maxecon Kent mill, three No. 2 Sturtevant ring-roll mills and a 6- x 10-ft. Allis-Chalmers rod mill. Small gyratory crushers were first considered as being economical units for crushing stone with a large free silica content. The resultant sand product consisted of flat-shaped particles which were unsatisfactory as fine aggregate in concrete.

It was found that either a Sturtevant mill or a Kent mill, of the ring-roll type, which have their best performance with a large circulating load, made a beautifully shaped product with a feed of plus No. 4 stone. These machines were not so successful in reshaping minus No. 4 stone coming directly from the plant gyratory crushers. The rod mill, a machine known for the remarkably granular character of its products, was found to be satisfactory for grinding the minus 4-mesh stone. The action in this machine is one which bevels off the edges.

The discharges from all the mills are passed over two FB-4 Jeffrey-Traylor screens. The oversize (plus No. 4) is returned to the Sturtevant mills and



Typical reduction crusher installation in a small stone plant. This particular crusher, by Bonnot, has been installed by Morris Limestone Products Co., Central, Ill., to increase the capacity of agricultural limestone



Elevation drawing illustrating the setting of crushing rolls to produce fine sand in plant of Zanesville Gravel Co., Dresden, Ohio

the minus No. 4 product is classified and dewatered in a Link-Belt 20-in. screw washer. This plant will be described in full in an early issue of ROCK PRODUCTS.

Manufacturing Sand from Silica Rock

Another plant that has installed equipment mainly for the manufacture of stone sand is the new plant of the Temple Slag Co., Temple, Penn. The deposit is unusual in this case and the process is radically different from any others with which we are familiar.

The deposit is a silica rock, testing 97.3 percent pure silica, and occurs as a decomposed or partially disintegrated formation. The plant produces natural and stone sand only and no coarse product.

After crushing, the silica is passed over a Kennedy 3- x 6-ft. double-deck screen. Minus 3/16-in. silica is washed in a Kennedy drag-type washbox. The plus 3/16-in. product is manufactured into stone sand in a Chambers 7½-ft. dry pan.

The bottom of the dry pan is made of manganese steel plates with 3/16-in. openings. The grinding tires are adjustable. When ground sufficiently, the stone sand passes the 3/16-in. openings to the boot of an elevator and is passed over a gravity screen. Plus 3/16-in. silica returns to the dry pan and the minus 3/16-in. product is the finished sand. About 100 tons of stone sand are produced in eight hours at this plant.

Stone Sand By-Product of Acme Limestone Co.

Another interesting plant manufacturing limestone sand is that of the Acme Limestone Co., Fort Spring, W. Va., which was described in full in the August, 1937, issue of ROCK PRODUCTS. In this plant, equipment already in place is effectively used to contribute toward the manufacture of stone sand, which is a profitable by-product.

The manufacture of stone sand was begun in an attempt to find a market for large tonnages of minus No. 4 mesh screenings. Stone sand is made as an adjunct to other stone gradings and the plant capacity for this product is variable, depending upon the crushing characteristics and setting of the crushers in producing commercial stone.

In the past few years the production of sand has increased, due to demands for more and smaller sizes of commercial stone, which means closer crusher settings and more fines. Sand is produced to meet West Virginia state highway specifications and others, with slight variations.

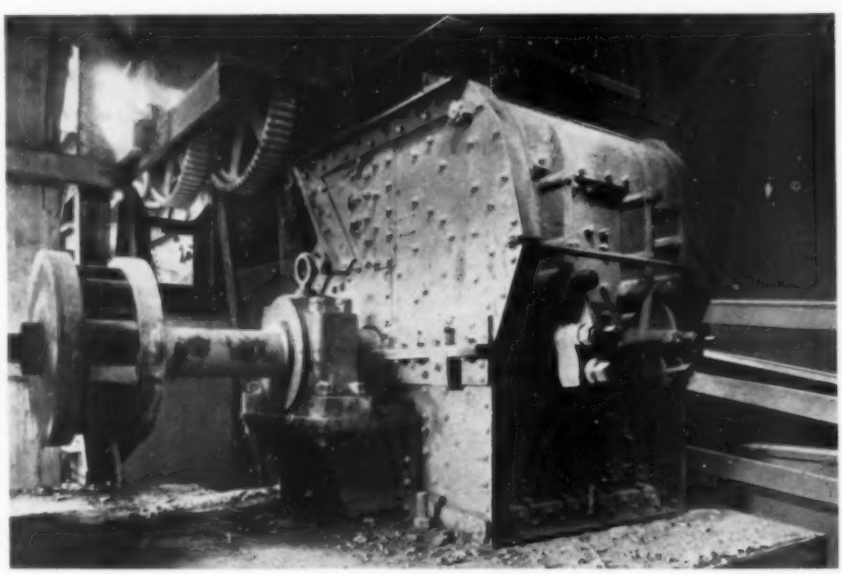
While the process of manufacture is dry, a small percentage of sand is recovered in the washing plant by the proper selection of sizes from a revolving screen and their passage to an Allis-Chalmers twin screw washer. This sand is blended with that made dry. Most of the screenings made into sand by the dry process are the result of passage of stone through gyratory crushers, which are then carefully graded.

Recrushing Gravel Particles

Merchandising ingenuity and fluctuating markets have been instrumental in increasing the application of crushing equipment in the sand and gravel industry. Trends are for a definite percentage of crushed particles in gravel. The year 1937, in particular, has witnessed a shortage of sand sizes in sand and gravel production, where the reverse is generally true. As a result some plants have been re-crushing grit and pea gravel to add to the natural sand and in some cases fine sand is being made from coarse sand.

Although the practice is by no means general, double-roll crushing has become increasingly popular for the recrushing of gravel and sand, usually where crushing is an important but minor part of the operation. There is also evidence of more of these reduction units in the stone industry.

Roll crushers have not generally had successful performance records in the



This Jeffrey 48- x 54-in. "Armorplate" swing hammer pulverizer, installed by Diamond Portland Cement Co., Middle Branch, Ohio, illustrates the results which may be had in large single pass reduction with this class of equipment. In taking steam-shovel size stone, the reduction is as follows: 96 percent through 1 in., 85 percent through ¾ in., 72 percent minus ½ in., 40 percent minus ¼ in., 32 percent through 6-mesh, 20 percent minus 10-mesh, 12 percent minus 20-mesh and 2.5 percent through 100-mesh

past in the rock products industry, probably because of unfamiliarity with their limitations or a tendency to tax their crushing capacities by having these types of equipment do a job for which they were not designed.

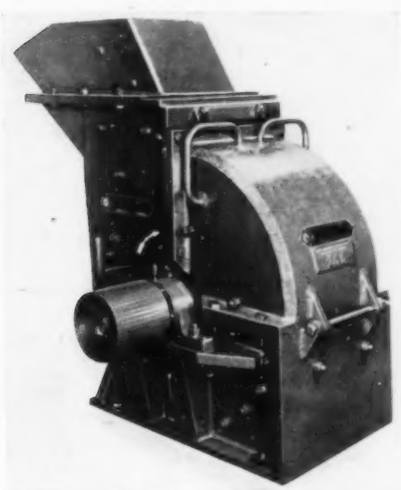
Some authorities claim that roll crushers when used for the reduction of limestone tend to give a slivery product and that the hammer mill on the same work will produce more of a cubical product. There is probably room for argument, but this discussion will concern itself only with the advantages, disadvantages and limitations of roll crushers, since this type of equipment is evidently being used more.

Most of the objections in the past to applications of rolls in the rock products industry have been due to the excessive wear of the rolls, maintenance expense and lack of uniformity in results because of flanging and corrugation of the rolls.

Much of the difficulty resulted from too large size feed, lack of control of the feed into the rolls and a tendency to attempt reductions greater than 3:1 or 4:1, which ratios are recommended. Larger feed than the angle of nip will allow, causes riding on the rolls and excessive abrasion.

An even, ribbon feed the full width of the rolls is desirable to eliminate surges and to give maximum production. Surges cause wear, and if the crusher drive is sufficiently powerful that it will not stall, the rolls will spring and allow stone to pass which is not reduced to proper fineness.

It is desirable to regulate roll speeds to the length of fall of the feed so that the roll speeds and the speed of travel of the incoming stone be approximately the same. Otherwise the differential speeds will cause slippage and abrasion.



Typical hammer mill of the type used to produce agstone. This "pulverator," by Allis-Chalmers, is designed to reduce man-size stone to finenesses suitable for agricultural purposes in one operation

Plus 2½-in. stone is split between two Farrel jaw crushers and two Traylor gyratory crushers, set for different openings, in producing various stone sizes at the new plant of Pennington Trap Rock Co., Pennington, N. J.

Two Methods of Operating Roll Crushers

Authorities say that there are two methods of operation of rolls—free, and choke feed. Each particle is treated individually in the first method and crushing is very uniform. In choke feeding, a bed of stone "rides" on the rolls and passes through in surges. It is said that less granulation takes place in choke feeding, which is recommended only with feeds of ¼ in. and under unless very large diameter rolls are used. Lower speeds are recommended where the feed is dry than when wet, for tough rock and for large reductions.

The consensus of opinion is that where the feed is uniform and regulated and desirable practices followed, rolls are economical and have great flexibility in making a variety of small product sizes, especially with reductions ranging from 1½ in. to 0.1 in. in size. Using large rolls with a small feed, maintenance costs are generally low and very large capacities can be had. Small rolls, when properly fed, will give better crushing results.

Undoubtedly many of this type of crusher have been installed, especially in gravel plants where crushing is a minor part of the operation, because of the comparatively low first cost, the low head room required, the lightness in weight and the ready portability of such equipment.

A typical example of a roll crusher installation in a gravel plant is a recent one at the Dresden, Ohio, plant of the Zanesville Gravel Co. Gravel business had been poor at this plant in 1937 as compared to previous years and it was necessary to excavate much gravel in order to produce sand for which there was a market. A 16- x 36-in. Welch double-roll crusher was installed to reduce the smaller gravel into sand so that the daily production of sand could be increased without increasing that for gravel. The sand production has been increased about 30 percent, varying of course with the pit run of the finer gravel, which was formerly waste material.

This crusher is driven by a 25-hp. motor, with one roll driving the other through geared driving links. A belt feeder 42 in. wide is driven through reduction gears and roller chain from the driving shaft to insure a uniform ribbon feed.

A roll crusher has also been installed at the Conesville, Ohio, plant of this company. J. J. Gorman, president of the company, says that this installation has not had sufficient trial to fully determine its economy of operation, but he reports that the principle seems to be working out and that definite sizing is obtained.

The crusher, at this plant, is placed at the end of the sizing screen and above a bin which receives the crusher discharge. Mr. Gorman says that the chief item of expense in operation is the replacement of the rolls when they have worn down. However, he believes that the low initial cost and installation cost are important factors in holding down the fixed investment in a sand and gravel plant. Since the only other crusher at this plant is a large jaw crusher, Mr. Gorman does not compare the performance of crushing rolls with other types of crushers. He recommends that an over capacity rather than exact designed capacity be provided for in installing this type of crusher as well as other equipment.

Many Factors Influence the

OUTLOOK For HOUSING

By NATHAN C. ROCKWOOD

IF CONSTRUCTION OF PUBLIC WORKS and public buildings subsidized by the federal government is curtailed in 1938, obviously producers of building and construction materials must look to commercial, industrial, public utility and housing construction for their markets. Since there is a universally acknowledged shortage of decent housing facilities, housing appears to be the market surest to develop. The questions to be answered are therefore, *when* *where* and *how*?

Apparently every effort is being made to hasten an inevitable housing boom; Roy Wenzlick, St. Louis, Mo., author of "The Coming Boom in Real Estate," has shown that in a 142-year record there has been an average interval of 18.3 years between the peak of one boom and the peak of the next. There has never been more than a 20-year interval. By these statistics the next boom is due to reach its peak about 1942 or 1943; but, of course, the general trend between now and then should be upward, although there may be temporary setbacks.

However, such statistics are not a certain guide because conditions in the 20 years ending in 1942 will not have paralleled conditions in the 20 years ending in 1922, or any other 20-year interval. Our rate of increase in population has definitely slowed down and there has been much shifting of population, a change in the average number of members to a family, and other factors which will have some influence.

As to *where* the new housing will be, it would appear that the South and Southwest and Pacific Coast are likely to see the most development, because industry and population growth are in those directions. At the present stage of housing recovery it appears that there is more new building in suburbs and the smaller cities than in the big cities. Most of the new housing in the big cities has been in slum clearance projects financed largely by government.

The present administration at Washington accepts as an established fact that private industry cannot profitably rehouse slum dwellers in decent homes. Therefore it accepts as a government obligation the supplying of decent homes to that class of people which is unable or unwilling to help itself to earnings that can provide for decent housing.

Wagner-Steagall Law

This kind of decent housing at public expense for the so-called underpaid is provided for in the Wagner-Steagall Act, which set up the United States Housing Authority. Nathan Straus, of New York City, was recently appointed administrator of this act. Mr. Straus described the purpose and administration of the act at the November conference on housing of the Chamber of Commerce of the United States as follows:

"Capital funds for rehousing slum dwellers are to be made available jointly by the United States Housing Authority and the local authorities. The U. S. H. A. may loan up to 90 percent of the cost of a project at not less than the going Federal rate of interest, plus one-half of one percent. At least 10 percent of the capital funds must be provided by the local authority. The rent per room necessary to pay all operating costs and also to repay the Federal loan with interest (in not more than 60 years) is determined. The rent which the slum dwellers in that city can afford to pay is determined. The difference between these two figures is then made up by an annual contribution or annual subsidy from the U. S. H. A. and from the city or state or other local authority. The act provides that the local authority shall contribute in annual subsidy at least $1 for every $5 contributed by the United States. The local authority's share may be in the form of cash, or tax exemption. In any event, only so much may be paid as an annual contribution by the U. S. H. A. as is necessary to achieve low rents. Thus the annual subsidies to bring rents in the new projects down to the figures slum dwellers can afford to pay, will become a joint responsibility of the federal and local governments. Although I can touch only on major provisions of the Act, there are, however, three matters of policy which are sufficiently important to be stated:

"(1) Construction costs — excluding land—are limited to $1,000 per room in cities of less than half a million population and $1,250 per room in larger cities.

"(2) A number of slum dwelling units must be eliminated equivalent to the number of new dwellings constructed under the Act in any locality—although this may be postponed in case of a housing shortage or emergency.

"(3) Apartments in the new buildings may be rented only to the lowest income families."

According to Mr. Straus, this federal government activity will not compete with private industry, and will supply only 10 percent of national needs. Since the slums are in big cities, slum clearance projects will evidently be in big cities. The actual amount of construction involved is given by Mr. Straus as follows:

"During the first year the United States Housing Authority may make commitments for annual contributions up to $5,000,000 per year. It may make commitments for an additional $7,500,000 per year in each of the following two years, and none after that without further authority from the Congress. The maximum annual burden upon the Treasury and the taxpayer for subsidies under the housing law is thus $20,000,000 per year, once the program is in full swing and assuming a program much larger than the $500,000,000 lent by the federal government. To maintain one-half a billion dollars' worth of such housing will be a burden on our annual budget of less than $18,000,000 per year.

* * * * *

"It is not an emergency program. It is not even an unemployment relief program—although it will be a great stimulus to employment. The Wagner-Steagall Act constitutes the charter of a rehousing program."

National Housing Law

The National Housing Act of 1934 is the law that the President asked a revision of in his recent message to congress. It has nothing to do with Wagner-Steagall Act for slum clearance in the big cities. It has a separate administrator—Stewart McDonald—the Federal Housing Administration. It is designed to encourage private building

with cheap government loans, or, rather, the F.H.A. insures loans made by banks, building and loan associations, etc., so that it amounts to a federal loan only if it should turn out "sour."

Should the President's recommendations be adopted in a revision of the National Housing Act, it will make for easier loans, at lower cost to the borrower, and hence is expected to provide an immediate stimulus to building. The favorable terms of F.H.A. loans have already done a great deal to encourage individual residence construction. Much, if not most, such building has been in suburbs of cities and in the smaller cities and towns. It is to this field that rock products and concrete products producers must look for most of their residential market for at least six months of 1938.

Outlook Not Discouraging for Highways and Heavy Construction

ACTING IN ACCORDANCE with his own expressed desire, and the insistent demand on the part of business, for a balanced budget, the President on September 20, announced that no more PWA allotments would be made after that date, when about one-third of the funds made available by Congress for 1937 had been allotted. There ended what most thinking people believed was the best form of federal "pump-priming". For, during its life PWA grants, which amounted to nearly $722,000,000, were responsible for the spending of $1,578,000,000 of public works funds raised by local authorities, making a total of about $2,399,000,000. Most of this went for permanently useful and economically justifiable schools, hospitals, waterworks, sewers and similar public service enterprises.

Local Public Works

Long prior to September the PWA program had been made unattractive to local authorities because the use of federal funds had been restricted to cover only the amount of relief labor used. This ran up the cost of the work beyond any cash benefit received, and as far back as the beginning of 1937 some few communities began rejecting PWA allotments and returned to a normal program of using their own money exclusively and letting contracts for construction projects in the regular way. When PWA projects had thus degenerated into the status of WPA relief jobs, it was time to make the change, but unfortunately all too few communities saw the light, and many still pin their hopes to a renewal of federal subsidies.

Before there will be a general revival of local public works it is probable we shall have to go through a waiting period to convince local authorities that the federal treasury can no longer be tapped for this purpose. If the President sticks to his decision, there is a very good chance that such public works will soon be back on a normal basis, financed entirely by local bond issues and local taxes, as all right-minded business men believe they should be.

Major Public Works

The outlook for major public works is by no means dimmed by the return of financing local projects to their own authorities. We still have large active federal projects such as the Fort Peck dam, the Grand Coulee dam, and many smaller ones for flood control and navigation. With the return of the annual spring floods there will doubtless be a revival of plans for many projects now dormant. On the West Coast the construction of a huge new dam and irrigation works for the Central Valley project, California, will tend to offset the completion of the San Francisco bridges and the Bonneville dam in Oregon.

Other large projects still active include the Los Angeles aqueduct and the beginning of the new Catskill aqueduct for the City of New York. These works are outstanding because of their size, but nearly every city has plans of similar nature for expansion and rehabilitation according to its needs. Thus Birmingham, Ala., for example, is building a new water-supply exclusively for industry. We see no letup in construction of this kind, particularly with such a favorable market as exists today for municipal bonds.

Highway Construction

It does not appear likely at this writing that the President's recommendation to omit federal aid for highways in the fiscal year 1938-1939 and reduce it to not over $125,000,000 per annum thereafter will be accepted by Congress. Under the present act Congress is obligated to appropriate $214,000,000 for federal aid in the fiscal year, July 1, 1938 to June 30, 1939. Nearly all authorities agree that the President's recommendation is unfair to the states, which have already made arrangements to accept the 1938-39 federal aid with a dollar-for-dollar matching construction program, especially since many of these state legislatures will not meet again before the spring of 1939.

Even were this 1938-1939 federal aid cancelled and the annual appropriation thereafter reduced to $125,000,000, the amount of highway funds collected by the various states and diverted to other uses would still exceed the present federal aid. In other words, it is really more important to prevent diversion of state gasoline and motor vehicle tax money than to preserve federal aid appropriations, from a strictly dollars and cents angle. However, one great advantage of the federal aid highway act is that it permits the federal Bureau of Public Roads to reduce federal aid to states which divert their highway funds. Without the federal aid law it is probable more such funds would be dissipated for relief of politicians and other things, but that is not primarily a concern of the federal government. Over a billion dollars was raised by the states in 1937 from motor vehicle and gasoline taxes, ostensibly for highway improvement, yet only a little more than half of this was actually spent for construction.

Industrial and Commercial Building

Lammot du Pont, president of E. I. du Pont de Nemours & Co., has said that 25 billion dollars would be spent for rehabilitation and expansion by industry and commerce if its directors had more assurance that they would not be further harassed by government. His figures are undoubtedly based on careful estimates, and few men are in a better position to make such estimates, for his own company and its affiliates present a fair cross-section of industry.

Probably 20 to 25 percent of this figure would represent construction, or there is about 5 or 6 billion dollars of such commercial and industrial construction in the offing. This is not an extravagant figure if one remembers that $350,000,000 was spent for construction in the process industries alone in the two years 1936 and 1937. The process industries are such as pulp and paper, rayon, heavy chemicals, petroleum products, coke, sugar, glass, lime and cement, etc. Admittedly they have been (with the exception of cement) rapidly growing industries in these two years, but they are nevertheless an index of what can take place in existing industries under favorable conditions as to outlook.

A Review of Practices in

SCREENING and SEPARATION

By BROR NORDBERG

THE YEAR 1937 has not disclosed any particular trend in screening and separation practices, unless it be along the lines of sand recovery and classification requirements. Producers of concrete aggregates, and particularly those filling federal contracts, are being made to recognize that the fine portion of a concrete mix has gained in importance in the minds of the engineers.

If the demand for drier, denser concrete mixes continues to gain, producers must face the situation and prepare themselves to produce a sand product containing, say, a definite percentage of 100-mesh product where 50-mesh is fine enough now.

The average deposit does not contain these sizings, or recovery of the fines can only be done at the expense of falling down on some other gradation or a failure to meet production requirements. While the needs of plants not producing federal specification material are being met with conventional types of sand recovery and classification material, variables in specifications and production demands have made operation procedures inconsistent in plants producing federal specification sand. A few cases are mentioned here to illustrate the problems encountered:

Recovery of Fine Particles

At Bellevue, Iowa, the Bellevue Sand and Gravel Co., operating a bank deposit, replaced cone sand collectors with a 12-ft. "Rotoscoop" to produce 60 to 65 cu. yd. of sand per hr. Specifications require, for construction of Dam No. 12 on the upper Mississippi river, that 95 to 100 percent pass the No. 4 sieve; 35 to 75 percent, the No. 16; 10 to 25 percent, the No. 50; and 1.5 to 7 percent, the No. 100. At this plant, half of the throughs from one of the conical screens (¼-in. square openings) bypassed the sand collecting device and some of the 3/16-in. minus sand from one of the conical screens is wasted, to step up the percentage of coarser sand.

A well dewatered sand is produced ready for immediate delivery by truck to the contractor's bins a short distance away. In order to meet the requirements for capacity and a comparatively dry sand, as well as to allow the engineers to adjust the 100-mesh content of the sand within the specified limits, fine sand is delivered to the contractor's bins to be used for blending. This sand tests 80 percent through No. 50 mesh and 34 percent through the No. 100.

In furnishing aggregates for the con-

Left: Bin washer installed by Des Moines Sand and Fuel Co-operative Association, Des Moines, Iowa, for separating out shale, coal and other undesirable material when loading gravel. Rejected carloads of gravel are also passed through the washer

Right: Stationary trash separator utilized by a southern producer of sand and gravel to remove trash and excess sand. Water from the discharge pipe of the dredge enters the housing tangentially. Fines and excess water overflow to the flume and gravel discharged below is pumped to the screening plant

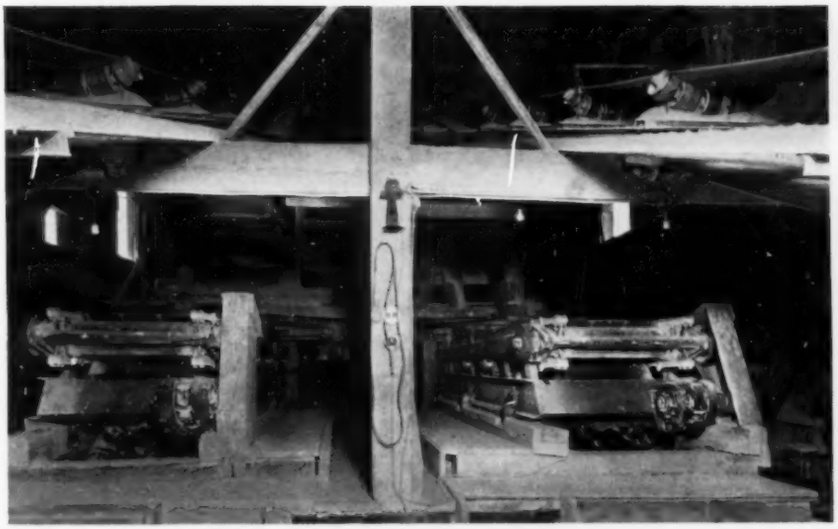
struction of Guntersville dam, Guntersville, Ala., the American Aggregates Corp., Greenville, Ohio, was required to furnish two sizes of sand split at the 30 mesh, the sizings being between the No. 4 and No. 30 and between No. 30 and No. 100 with proper gradations therein.

This material and the gravel was to be excavated from the bed of the Tennessee river, being pumped through a 16-in. pipe line to a floating gravel plant. The minus 3/16-in. sand, removed by the use of fencing around the discharge box, by a coal bar grizzley screen and through the bottom decks of the sizing screens flows into two 8-ft. Wood classifiers which are set to split sand at 30-mesh.

Excess water and variations in deposit require additional mechanical screening to insure the production of both the coarse and fine sands within their tolerances. Coarse sand is separated from the water in the classifiers and is drawn to a settling tank and pumped by three 4-in. centrifugal pumps on to three Tyler 400-class vibrators.

By using 26-mesh cloth on these vibrators, the removal of the minus 30-mesh sand from the coarser sand is completed. The coarser sand retained on the vibrators is delivered to a barge and the minus 30-mesh sand removed by the classifiers and vibrators is delivered with all the water into a settling tank 22 ft. in width and 24 ft. in length.

A weir box was provided at the intake end of the settling tank to accomplish an even distribution of sand and water over the entire width of the settling tank. The settling tank has baffles to create currents at certain points and retard the flow at other locations.



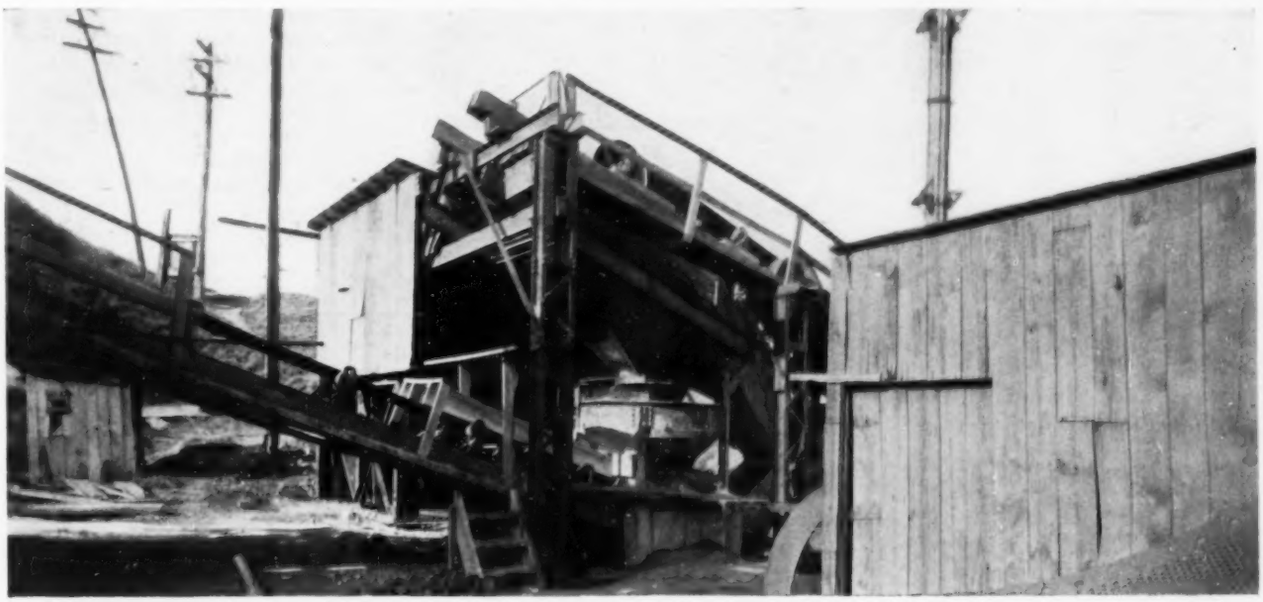
New 3½- x 12-ft. Symons double-deck horizontal vibrating screens in the Independence, Mo. plant of Stewart Sand and Material Co.

The baffles allow regulation of the proportion of sizes in the fine sand. Any portion collecting in the various pockets making up a part of the settling box bottom area can be wasted, enabling the production of almost any combination of sizes below the 30-mesh. The fine sand is drawn from the tank and is pumped by a 5-in. pump to a surge box. From the surge box, the fine sand, with a regulated proportion of water, flows over a 20-mesh gravity screen which removes trash and any oversize.

To insure reducing the debris, coal and shale content in gravel to less than 0.5 percent in meeting state highway specifications, the Des Moines Sand and Fuel Cooperative Association, Des Moines, Iowa, has installed a bin washer that has saved many rejected cars of material.

The deposit under excavation has a relatively high percentage of shale and coal. The gravel is passed through gravel washers where most of the shale and coal is floated out. Larger shale and coal particles, not easily raised by a current of water and floated off, are hand-picked from the larger gravel sizings.

The bin washer was installed adjacent to the stockpiling area and the railroad siding, as occasionally cars of gravel were rejected at destination and returned because of a slight excess in coal and shale content. All stockpiled gravel



Simplicity D'Centegrator in Attica, N. Y. sand and gravel plant of Buffalo Slag Co. reduces soft material in sand to pass state specifications. Minus 3/8-in. material from vibrating screen above feeds to the machine, which throws it against a breaker plate when rotating at 1450 r.p.m. Water is introduced within the machine to undercut sand and prevent sticking to the breaker plate

Typical low head vibrating screen with three decks. This particular screen, manufactured by Allis-Chalmers Manufacturing Co., has a bottom plate and twin vibrating mechanism

is passed through the gravel washer before shipping as a check on the efficiency of the plant to remove objectionable material and to remove debris and dirt accumulated during storage.

This bin washer, manufactured by the Eagle Iron Works, Des Moines, Iowa, comprises a 35-cu. yd. steel bin over a regulation 24-in. single revolving screw washer, the unit being portable on skids. Gravel is loaded direct from stockpile into the bin and its flow into the feed end of the washer is regulated by a slide gate. The discharge at the top of the screw flight passes over a chute into the cars or trucks, free water being removed through 3/16-in. perforations in the chute bottom.Water is introduced into the bottom of the wash box through a 5-in. line tapped into the regular plant water line, and the overflow from the washbox goes to a sump.

Within the past few years specifications have become more rigid as regards the presence of soft stone in gravel and the very existence of some plants has been threatened. An unusual requirement, for example, is that of the Metropolitan aqueduct for which the Consolidated Rock Products Co., Los Angeles, Calif., is furnishing much of its output. It was required that no more than 15 percent of the particles which show evidence of crushing be in the product.

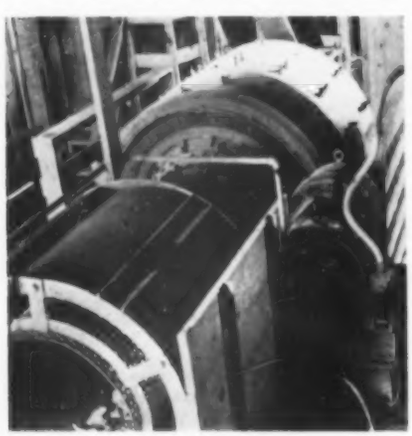
One of the standard commercial machines on the market was tried. The soft material was eliminated, but so many particles showed fracture that rejection was inevitable. The plant had been shut down because material showed losses from 38 percent to 42 percent on the "rattler" test.

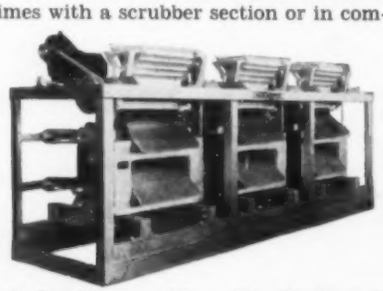
Plant engineers worked out a soft stone eliminator that has been successful in reducing the losses to from 27 percent to 28 percent, to pass the city's specifications by a good margin.

The eliminator is a cylinder, 20 ft. long and 6 ft. in diameter, made of $\frac{3}{8}$-in. plate. The cylinder is reinforced with angle iron rings on the outside and is lined with old manganese steel plates. The discharge end is entirely open, while the feed end has an opening just large enough to take in the feed spout.

Five 6-in. angle irons are spaced equally around the circumference and run the entire length of the cylinder. The fall of the soft pieces, and the blows they receive from falling harder pieces break the soft pieces so that they will pass a $\frac{3}{8}$-in. screen. The $\frac{5}{8}$- to $3\frac{1}{2}$-in. sizes go to the eliminator, representing about 35 percent of the tonnage. According to company engineers, the correct proportions of hard and soft particles are required for successful application of this type of machine. One of the illustrations shows an installation of a Simplicity "D-Centegrator" which, as far as we know, has been very effective in removing soft material from concrete sand at the Attica, N. Y., plant of the Buffalo Slag Co.

The vibrating screen, as was to be expected, during the past year has increased more in popularity for sizing gravel and stone. The revolving type scalping screen is still much in favor in new sand and gravel plants, sometimes with a scrubber section or in combination with a scrubber, because of the intensive scrubbing and abrasive action possible with such heavy duty screens.

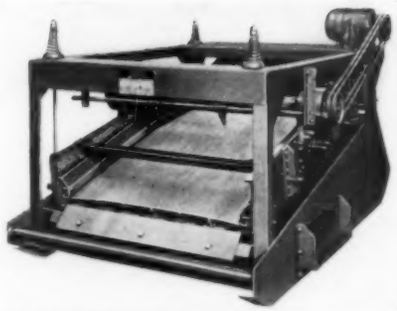




Left: Installation of 6-ft. x 48-in. Hardinge Integral Drive Scrubber at the Roseklip mine, Bodie, Calif. to scrub clay and silt from ore.

Above: Three field gravity induction type separator manufactured by the Stearns Magnetic Manufacturing Co. Recently a 90-in. magnetic separator of this type was shipped to an Eastern silica sand producer for use in separating iron particles from sand.

Right: Conventional double-deck vibrating screen (Williams) of the type used in the rock products industries

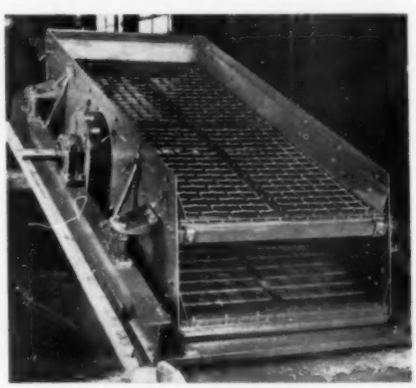


Shale shaker, manufactured by Allis-Chalmers, which illustrates types of equipment adapted to the screening of slurry and finer classifications of granular materials

Electrically vibrated screens and horizontal, or low-head, mechanically vibrated screens are evident in increasing numbers. The former lends itself particularly well to the screening of fine sizes (below $\frac{3}{8}$ in.) and for closed-circuit work with ball mills, rolls and kominuters while most of the low-head screens are used for intermediate sizing ($\frac{1}{4}$ in. to $1\frac{1}{2}$ in.). The low-head screen, in a number of plants, is easily installed within dimensional limits and, in new plants, has enabled operators to cut installation costs of elevating equipment.

When vibrating screens were new on the market, the high capacity features were often overdone and results were not what they should be, either in the accuracy of sizing or in screen life. Newer plants are more properly designed.

The Pennington Trap Rock Co., Pennington, N. J., has a new screening plant that illustrates good screening practice. Seven sizes of stone are sized over two 4- x 20-ft. Symons horizontal $2\frac{1}{2}$-deck screens. The crushing capacity of the plant is 250 to 300 tons of trap rock per hour. The capacity of the screens is 1000 tons per hour to allow for load fluctuations and to give plenty of screening surface to all stone particles. Low maintenance costs will undoubtedly offset the higher initial cost of large screens and justify the added expense.



Diesel — Electric — Gas — Oil

POWER DEVELOPMENTS

By R. S. TORGERSON

DURING THE PAST TWO YEARS there have been several distinct trends noticeable in the use of power in the rock products industry. These changes have resulted from conditions which are more or less peculiar to the industry. For example, a majority of the plants in this industry are located either on the outskirts of cities or a considerable distance from towns of even small population.

This situation long made a considerable part of the industry dependent upon its own resources in supplying power for various plant operations. Steam engines for direct drive were superseded by electric generators driven by steam power units. Electric motors to drive plant equipment at remote locations offered a flexibility in operation which was not previously available with the steam engine driving direct or through complicated shafting and belts.

Diesel Engines

The latest power development in crushed stone and sand and gravel plants goes a step farther to secure flexibility and economy of operations. Diesel engines are coming into increasing use in the industry, not only to generate electric power, but as primary power units to drive equipment direct. There are a number of reasons why these power units are gaining in popularity, but only a few of the important factors will be mentioned. In some cases, of course, the Diesels replace power units which have become obsolete. According to information available, operating costs are comparatively low as the Diesel equipment requires very little attention, is easy to maintain, and the fuel consumption is low.

As previously pointed out, many quarry and sand and gravel operations are not within economic reach of power lines. In some cases the voltage drop is often too great to meet the peak demands in operating heavy machinery, resulting in overheated motors and costly breakdowns, with a reduction in production when demand is at a high level. In other cases, power companies have changed from 25- to 60-cycle current, making it necessary for the rock products producer to change over his motor equipment at considerable expense.

Another important factor involved in the change to Diesel power is the minimum demand charge imposed by power companies. Power requirements are so variable under present operating conditions for rock products plants that during certain periods many kilowatts of energy are being paid for but not used. On the other hand, the Diesel may be shut down whenever a reduction in demand may require such action without any charge against operations, except interest on the investment.

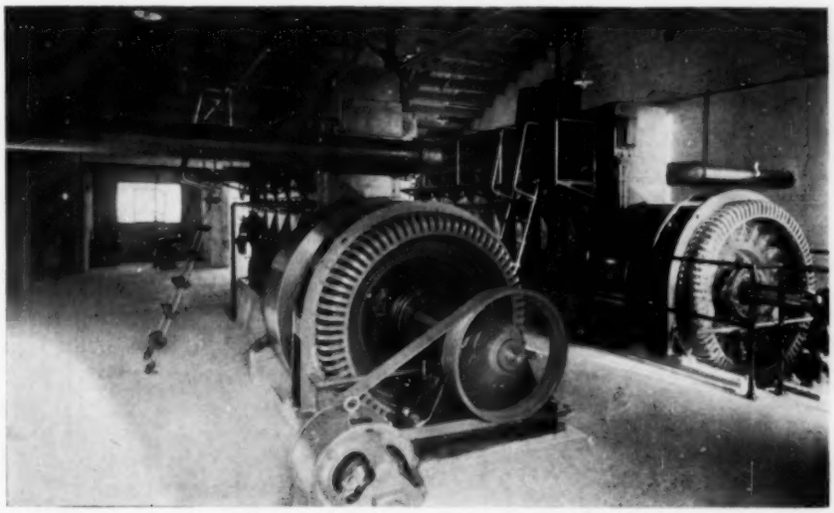
Diesel-electric installations have operated satisfactorily under heavy loads. In the Valmeyer, Ill., installation of the Columbia Quarry Co., for example, a National-Superior 560-hp., 8-cylinder Diesel, direct-connected to an Allis-Chalmers 485-kv.a., 60-cycle, 3-phase generator has a constant plant load of 320 kw., and a peak load of 410 kw., not including a Bucyrus-Erie 32-B, 1½-cu. yd. electric shovel, which at times imposes an additional load of 225 kw.

Another interesting application of Diesel-electric power units is in the new plant of the Gibsonburg Lime Products Co., Gibsonburg, Ohio. In this case, the primary crusher is driven off the engine shaft by means of a belt drive, and is controlled by a Dodge clutch. The Diesel engine shaft, however, is direct-connected to the generator that furnishes power to operate the electric shovel, the crushing and screening plant, the pumps, air compressor and secondary crusher. It also furnishes current to drive motors in the lime and stone plants at night when the electric shovel is not operating.

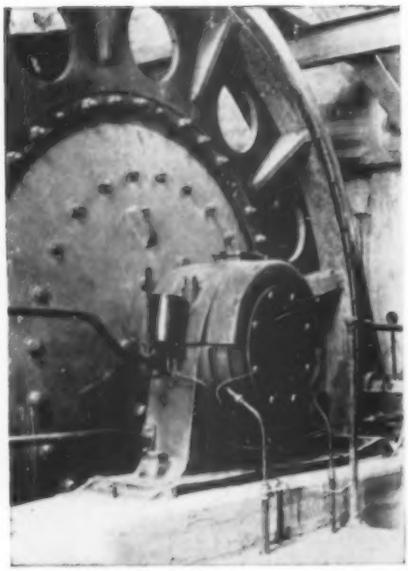
A Diesel-electric unit is operated by Gifford, Hill and Co., Inc., Dallas, Tex., at the Turkey Creek sand and gravel plant. With this unit the water pump for supplying cooling water for the engine and the exciter are driven off the main shaft.

Dredge operation perhaps furnishes one of the most common uses of a Diesel-electric unit. In some installations the Diesel drives the pump direct and a V-belt drive to the generator furnishes power for land operations which may be considered almost the reverse of former practice. The Schoenberg Gravel Co., Georgetown, Miss., installed a 130-hp. Caterpillar, 6-cylinder Diesel engine on a dredge to drive the pump, through a V-belt drive. A gasoline engine drives a 3-in. pump, which supplies 75-lb. water pressure to the dredge pump stuffing box. The same 3-in. pump serves as part of the cooling system of the Diesel engine, which is not equipped with a radiator.

Many shovels and cranes are now operated with Diesel engines, and



Diesel-electric installation in the plant of the Ste. Genevieve Lime and Quarry Co., Ste. Genevieve, Mo. One of the units is a type VDSB 8-cylinder National-Superior Diesel direct-connected to an Allis-Chalmers a-c. generator with a rating of 2300 volts, 625 kv.a.; the other unit is a 375-hp., 4-cylinder Diesel, of the same type, direct-connected to a 2300 volt a-c. Allis-Chalmers generator, rated at 312 kv.a.



Auxiliary type lubricating system designed to be used with heavy mills to facilitate starting. Its operation is entirely independent of the main lubricating system

manufacturers make this equipment optional.

Operating Costs of Diesel Units

Costs of operation of typical Diesel engine installations are given herewith. At the Columbia Quarry Co. installation, Krause, Ill., two 4-cycle, cold starting, mechanical injection National-Superior Diesel engines were installed; one an 8-cylinder rated at 525 hp., and the other a 6-cylinder rated at 400 hp. Fuel consumption is guaranteed not to exceed 0.4 lb. per brake horsepower hour at the rated load, and lubricating oil not to exceed 1 gal. for each 3000 hp. hour.

The Pennington Trap Rock Co. operates two Busch-Sulzer 450-hp. Diesel engines, each direct-connected to a Westinghouse 375-kv.a., 60-cycle, a.-c. generator. It has been found that each truck load of 11 tons of stone requires 2 gal. of fuel oil for power in completing the processing circuit which, at a cost of 5½c per gal., represents a power cost of 1c per ton of stone in the bins.

Oil Burning Engine

Another power development which is attracting considerable attention is the oil burning engine which has characteristics of both gasoline and Diesel units. The Hartland-Verona Gravel Co., Verona, Wis., has had very satisfactory results with an EKH oil burning engine. This unit operates, through direct drive, one 14- x 44-in. jaw crusher, one 24- x 42-in. roll crusher, one 4- x 10-ft. vibrating screen, one 30-in. Peck return bucket elevator, one 30-in. conveyor belt (37-ft. centers), and one 24-in. belt conveyor, 90-ft. centers. In addition to this load the oil engine drives a 90-kv.a. generator, which furnishes power for six motors totaling 95 hp. When running road gravel or other dry, crushed material, 70 hp. of the motors are not used. The oil engine uses approximately 9 gal. of fuel oil per hour when running road gravel. Under full load or when washing, the engine consumes about 10½ gal. per hour. Fuel costs 5.85c per gal. Lubricating oil consumption has averaged 150 to 200 hours of operation between changes. The crankcase holds 78 quarts. Maintenance costs are reported to be low.

Electric Motors and Drives

High power requirements at low speeds demanded of grinding mills and cement and rotary lime kilns has resulted in electric motor improvements. While there is apparently a trend toward the smaller, high speed motor, with reduction gears, electrical engineers are not agreed that smaller motors in every case will give the service desired. Larger built-in motors are in many instances a better investment, particularly where high room temperatures are involved.

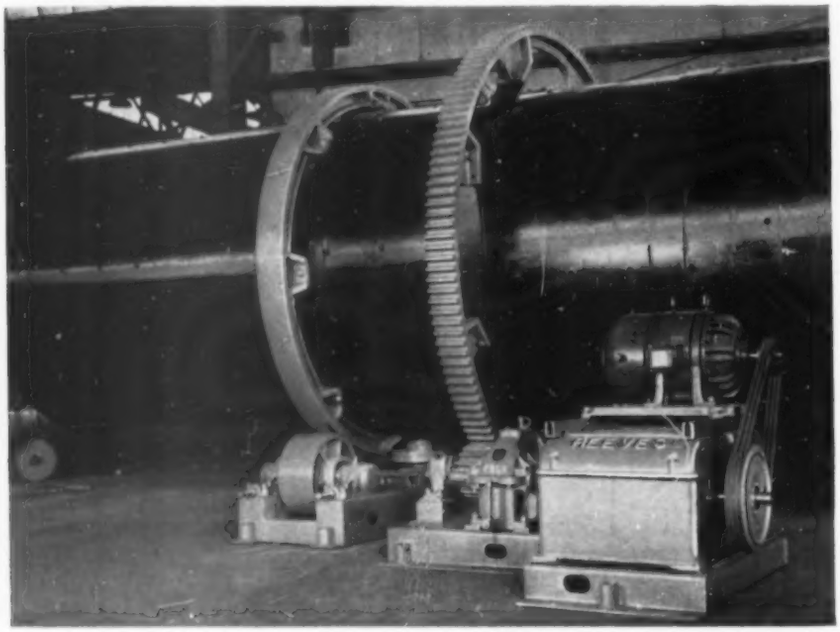
Illustrating the trend in the larger electric motors, a cement plant recently installed two G.-E. 900-hp. synchronous motors to drive tube mills. These motors have a speed of 720 r.p.m., considerably higher than that generally used for such a large tube mill. The small size of motors is remarkable compared to those of similar installations.

An interesting example of electric motor application to conveyors is the mile-long continuous conveyor system at Grand Coulee dam which carries about 52,000 cu.yd. of material a day. Twenty-five 200-hp. G.-E. motors operate the individual conveyor sections, which range from 200 to 275 ft. in length. Stacker, shuttle conveyor, and feeders are also motor driven. Operation of the system is electrically interlocked so that a stoppage of any one section automatically stops all sections on the incoming side.

Along with the development in power units have come improvements in various drives, speed control, clutches, pulleys, etc. Higher speed electric motors have brought about the development of more efficient speed-reducer units and synchronous automatic control of widely separated but closely related equipment. This development is particularly advantageous in the operation of cement kilns and rotary lime kilns in which there must be synchronous control of the raw feed with the rotating speed of the kiln and the process of fuel combustion at the firing end.

Hoist control has been made more flexible and the speed of operation has been increased by the wider use of the Ward-Leonard adjustable voltage equipment.

Increased use of instruments and meters for control of cement and lime kilns also has been found to be a profitable investment.



Rotary dryer built by C. O. Bartlett & Snow Co., Cleveland, Ohio, equipped with a Reeves variable speed transmission, is a typical application of this equipment

Trends In Direct Firing and Cooling

CALCINATION DEVELOPMENTS

By BROR NORDBERG

PORTLAND CEMENT MANUFACTURE is a much more complex process than it has been in the past. The industry on the whole is endeavoring to make the finest product that money can buy, but there do exist differences of opinion on operating technique that make it difficult to foresee what will be the accepted procedures a few years hence.

Trend Is Toward Direct-Firing of Kilns

However, one universally acknowledged advance is direct firing of the rotary cement kiln from a pulverizer unit. In the past few years we know of 117 individual mills installed for firing cement kilns and 21 units for firing lime and hard-burned dolomite kilns.

Reasons for discarding other equipment in favor of mills which grind the coal, dry it and inject the pulverized product into the kiln in one operation are numerous. Cement manufacturers, in whose plants we have observed the operation of direct firing mills, are well agreed that their installation has effected savings in coal, that cleaner working conditions now exist and that the explosion hazard has been largely eliminated.

Savings in coal will naturally accrue where there is a feed of uniformly sized coal, a uniform weight of coal, and where a constant amount of primary air will insure a uniform rate of combustion. Primary air temperatures, the size and feed of pulverized coal, and the mixture temperatures are on the way to be entirely automatically controlled in direct-firing-mill installations.

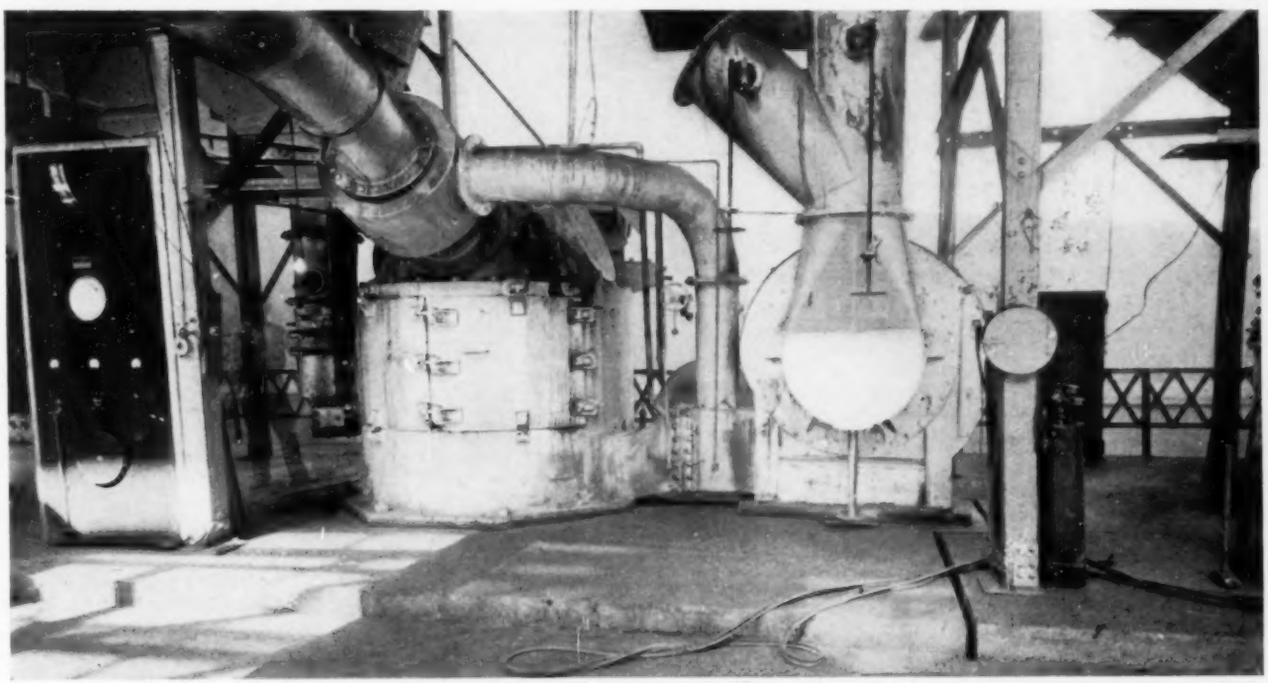
In addition to a more uniform flame and better combustion, cement manufacturers claim actual savings of from 5 to 20 percent in coal burned per barrel of cement.

In interpreting these figures the experience of the kiln operator and the type of discarded machinery must be considered. The higher figures likely apply where the operator has had sufficient experience with the new machinery to develop the full capabilities of the direct firing coal mills.

More efficiency in burning will likely be realized in some of the other cases when greater experience is gained. However, savings are calculated from comparisons with performance of the discarded methods of firing. Other conditions being equal, of course, the plant with the least efficient coal pulverizing and handling equipment before will show the greatest saving in coal consumption.

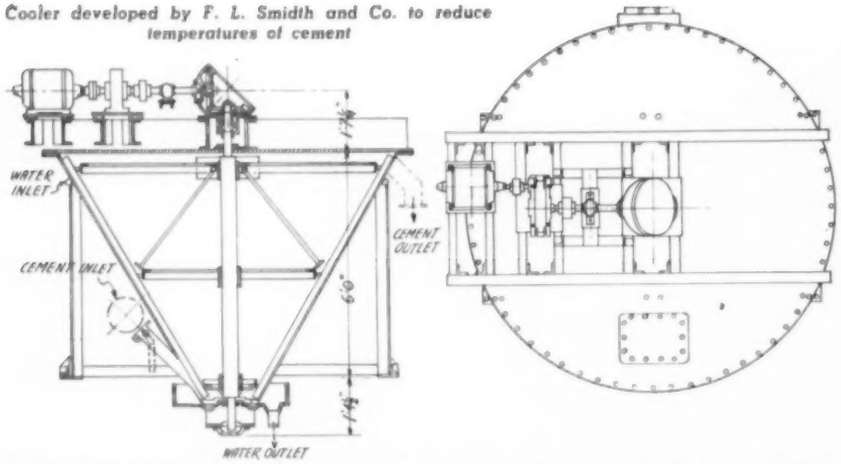
Maintenance costs and labor generally were higher when the kilns were fired by centralized grinding systems where pulverized coal was pumped to individual bins and fed to the kilns.

Practically all the plants visited in 1937 reported savings in connected electrical power, the average figure being about 50 percent. For example, when No. 402 Raymond Bowl mills were installed at the Diamond Portland Cement Co. plant, Middle Branch, Ohio, the connected electrical power was reduced from 475 hp. to 205 hp. A quite complicated coal-handling system was displaced at the Hawkeye Portland Cement Co. plant, Des Moines, Iowa, when



One of three new Babcock & Wilcox No. 150 direct-firing coal mills at the Dewey Portland Cement Co., Davenport, Iowa, plant. Primary air is taken direct from the kiln hoods to dry the coal while being ground, which is typical in the majority of plants. Pipes from the coal mills to the burners are curved upward in this plant to give ample head room on the burning floor

Cooler developed by F. L. Smidth and Co. to reduce temperatures of cement



Sectional drawings of new cement cooler consisting of a water cooled conical tank and an agitating device. The agitating device comprises a vertical shaft and agitator arms interconnected by flights which are parallel to the sides of the tank. Cement is introduced near the bottom of the cooler and is then conveyed in a thin layer along the water cooled wall of the tank to the top where it discharges. Cooling water is sprayed on the outside of the conical tank and adheres to the cone in a thin layer over its entire surface

six Babcock & Wilcox direct-firing mills were installed recently. This plant has a waste-heat power plant. The actual connected electrical horsepower saving of 135 was increased to 405 hp. due to the inefficiency in generating direct current electricity for driving the discarded equipment.

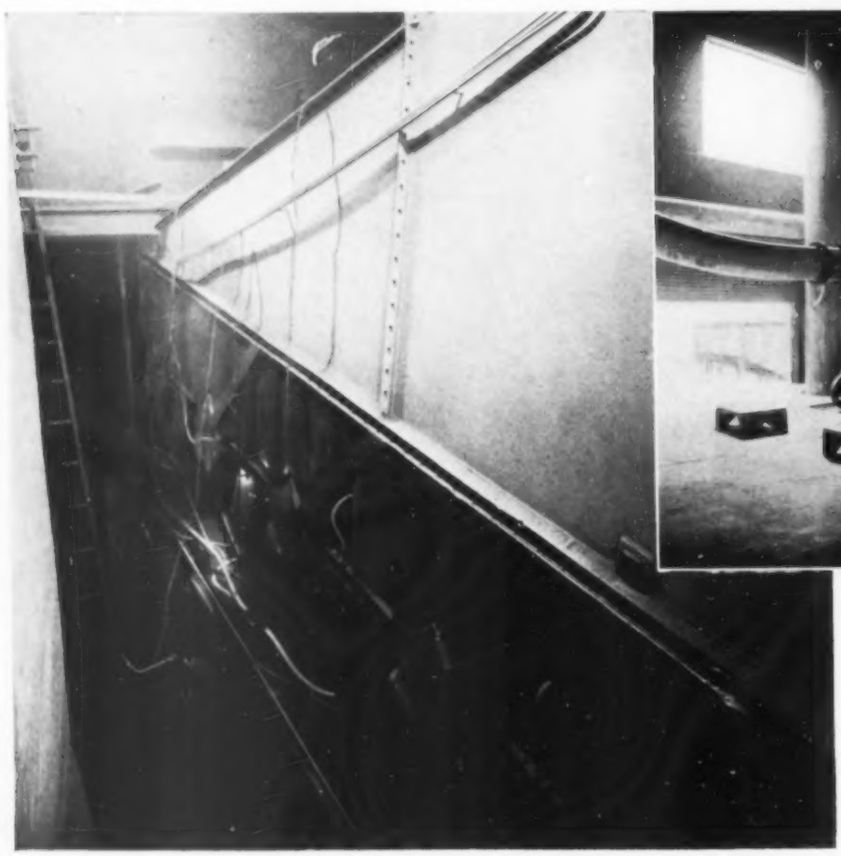
At several plants, installation of new coal grinding machinery has displaced a system from which other machinery received its coal feed. At the Diamond Portland Cement Co. plant some provision had to be made to fire the shale and stone dryers. An 8-in. line was welded into the 14-in. line carrying pulverized coal from the Raymond Bowl mills to the kilns, and sufficient coal was "skimmed off" to fire the raw material dryers. After passing through cyclones to bins, this product is pumped to bins and fed to the dryers.

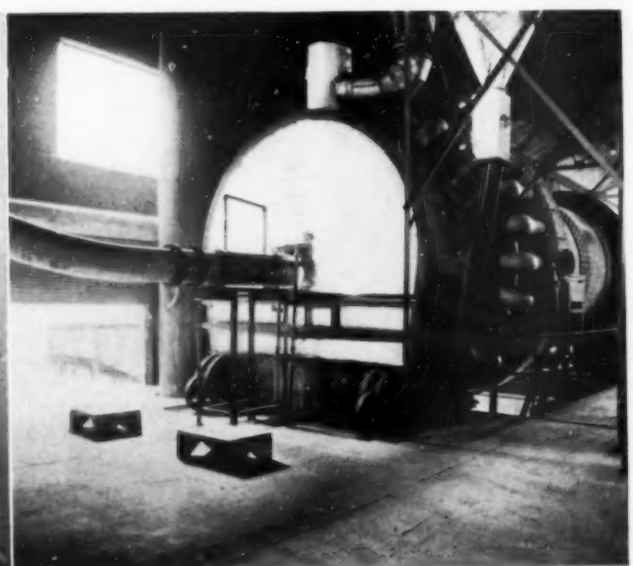
At Detroit, Mich., where Babcock & Wilcox mills were placed in the plant of the Peerless Cement Corp., a No. 120 mill is now firing the 500-hp. auxiliary boiler.

Some of the plants under consideration report that a higher quality clinker has resulted because of the uniform, short, hot flame and the closer control of the burning operation. One plant superintendent reported a 4 percent increase in the clinker output of his kilns since installation of direct-firing.

Operating practices at these plants are fairly uniform, and follow closely the recommendations of the machinery manufacturers. Plant limitations and other conditions have their influence, for example, in the method of taking of primary air from the kiln.

The more common practice is to take primary air from the kiln hood, temper it with cold air and introduce it into the mill. When Raymond Bowl mills were installed at the Petoskey Portland Cement Co. plant at Petoskey, Mich., it was found practicable to take primary air from the breeching between each return cooler and its kiln. At another plant, primary air is taken from the hot clinker conveyor below the kilns, at 1200 deg. F., and tempered before entering the coal mill.





Above: Heat recuperator installed by Medusa Portland Cement Co., Toledo plant, to suddenly chill clinker while in the hot zone. Clinker temperatures are sharply reduced (2500 deg. F. to 1000 deg. F.) by air entering through the plates in the Vanderwerp recuperator

Left: Secondary air-quenching cooler at Howes Cave, N. Y. plant of North American Cement Corp., employs vibrators (Jeffrey-Traylor) for intimate contact of clinker with the cooling air

Above: The new lime plant of H. E. Millard, Annville, Penn., features the latest and most efficient practices developed in the portland cement industry from the standpoint of types of machinery and control. The 290-ft. Unax kiln, designed and manufactured by F. L. Smidth and Co., New York, is similar in design to those with integral coolers in use in the cement industry. On the extreme left is the Atox coal mill which grinds the coal to 99.8 percent through 200-mesh. Primary air taken from the kiln is tempered to enter the coal mill at 165 deg. F. or less. The mill is built on the suspended roller principle, the grinding pressure being obtained by spring loading of the roller suspensions without direct contact between the rollers and the grinding ring. The mill is equipped with an integral air separator, a cyclone collector and a specially designed fan, and is generally operated under suction. A similar mill in Mr. Millard's plant grinds quicklime to 99 percent through 200-mesh. All controls for the manufacture of lime converge at the burning floor on the left and frequent specimens are taken and tested at this point and by an inspector at the "skipulter" below

The average temperature of the primary air entering the coal mills in most cases ranges from 250 deg. F. to 500 deg. F. This temperature is of course varied with the moisture content of the coal and is limited by the fineness of the grind.

Temperatures of the coal and air mixtures average about 170 deg. F. and the primary air makes up from 30 to 35 percent of the combustion air. Coal fineness ranges from 80 to 98 percent through 200 mesh, a coarser grind being sufficient when burning high volatile coal.

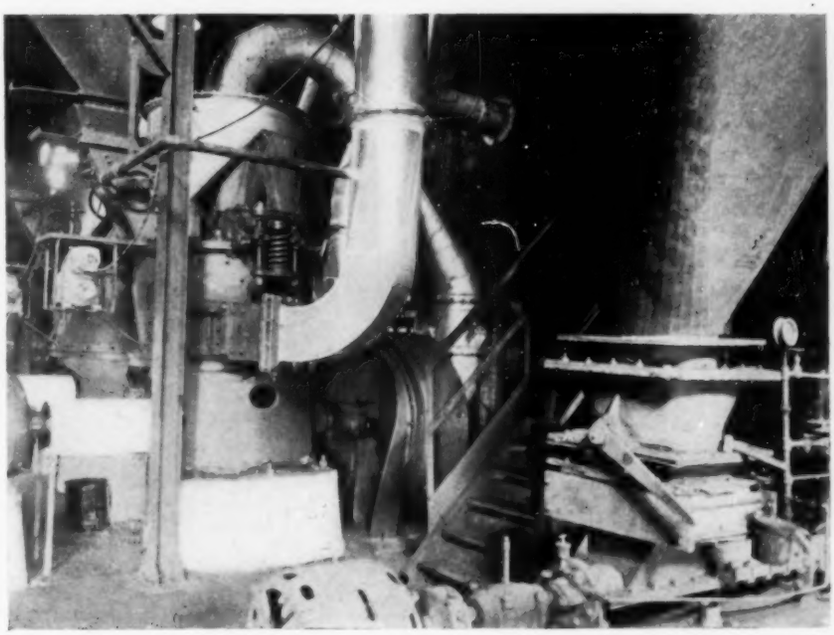
Heat Recovery

Simultaneously with improvement in control of burning, the rotating speeds of a number of kilns have been increased as much as 10 percent to increase production.

During the year, heat recuperating equipment has been installed on a number of kilns.

Authorities are beginning to agree that sudden chilling "freezes" the clinker and makes inert any free lime and magnesia, which are held respon-

Below: Raymond bowl mills do more than fire the kilns at the Diamond Portland Cement Co. plant, Middle Branch, Ohio. Pulverized coal is "skinned off" from the pipe to each kiln burner through an 8-in. pipe and is used to fire the stone dryers



sible for some of the unsoundness in cement. Some of the recuperating equipment originally installed, for maximum heat saving only, has not met this requirement.

Coolers of the air quenching type have been installed in a number of plants, and there is a decided trend toward the use of secondary coolers, usually rotary type, to reduce clinker temperatures to as low as 12 to 50 deg. above atmospheric temperatures.

Lime

In the calcining of lime, the outstanding development in 1937 was the introduction of very long rotary kilns (350-400 ft). These installations have been in operation but a short time and it has not been possible to determine with exactness the kiln performance, the lime-fuel ratio, capacities and other pertinent figures, but there is every reason to believe that fuel efficiency and quality of product are improved by lengthening the kiln.

Rotary kilns for burning lime have always been considered inefficient in their ability to utilize the major part of the heat in the gases. Increased length permits a recovery of much of that heat which would, in an average rotary lime kiln, go out the stack as waste. By adding length, radiation losses increase proportionately, but modern methods of insulation in these new kilns serve to minimize radiation losses. The net result in the plants with which we are familiar is a stack temperature not exceeding 750 deg. F. in either case.

By maintaining top temperatures not to exceed 2400 deg. F., it has been proven practicable to produce high quality chemical lime, when burning coal, without ash contamination. At these temperatures, the ash does not flux with the lime and passes out the stack.

Another notable rotary-kiln installation made during 1937 has apparently shown that a limestone which dusts too readily in the burning process can not be made into lime economically in large rotary kilns.

The illustrations point out the outstanding features of the new lime plants of H. E. Millard, Annville, Penn., and the Chemical Lime Co., Bellefonte, Penn. (described ROCK PRODUCTS, August and April, respectively).

Cement Statistics

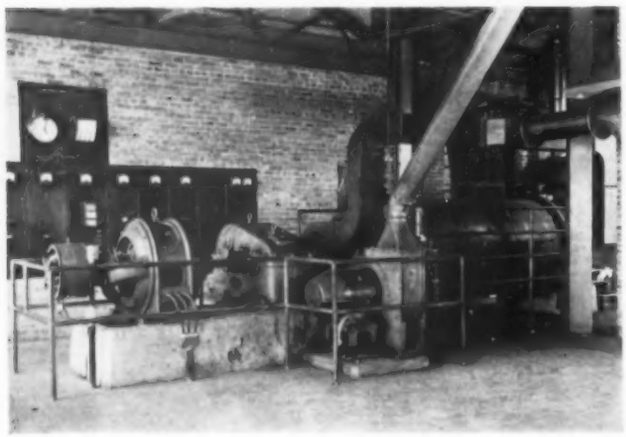
PORTLAND CEMENT INDUSTRY in November, 1937, produced 9,248,000 bbl., shipped 8,189,000, and had in stock at the end of the month 22,627,000, according to the Bureau of Mines. Production and shipments in November, 1937, showed decreases, respectively, of 15.8 and 8.4 percent, as compared with November, 1936. Stocks at mills were 12.5 percent higher than a year ago.

The statistics here given are compiled from reports for November, received by the Bureau of Mines, from all manufacturing plants.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 160 plants at the close of November, 1936 and 1937.

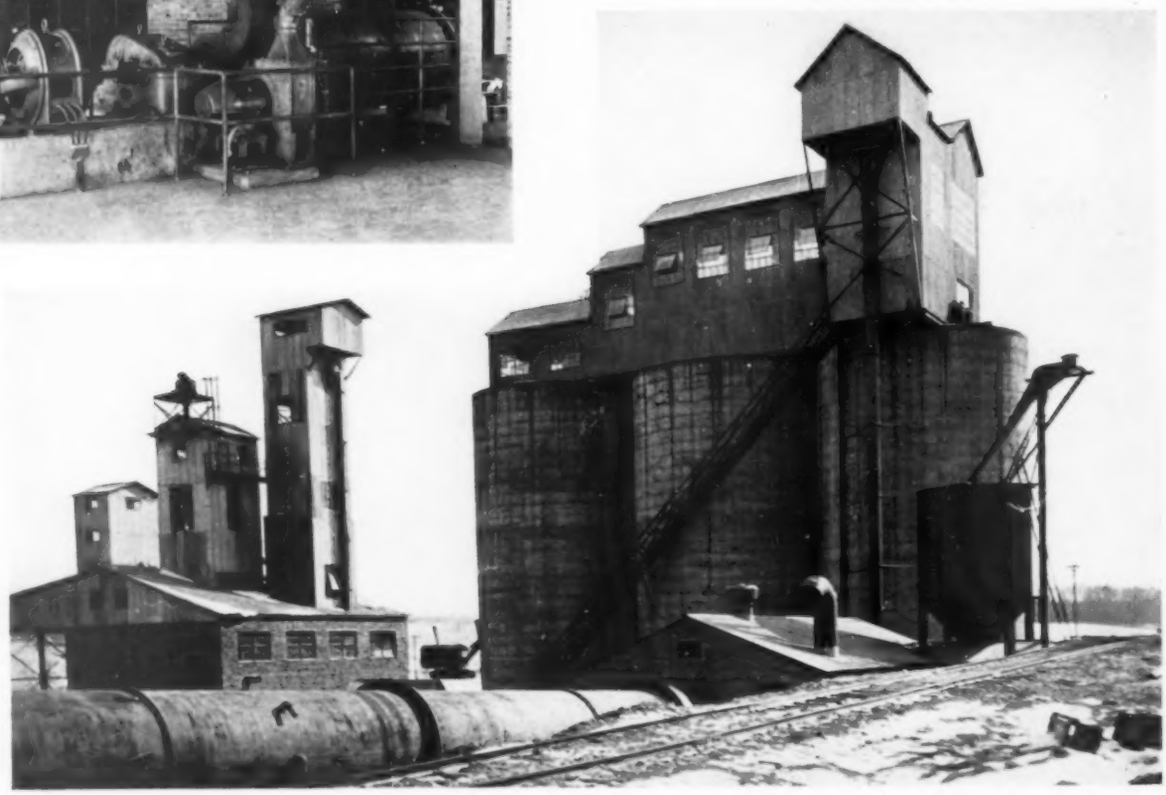
RATIO (PERCENT) OF PRODUCTION TO CAPACITY

	November 1936	1937	Oct. 1937	Sept. 1937	Aug. 1937
The month..	50.9	43.7	52.0	53.1	54.4
The 12 mos. ended	41.5	46.0	46.7	47.1	47.6



Left: Kennedy air swept tube mill for firing the longest kiln, with coal pulverized to 98.4 percent minus 200-mesh. Heat recovered in the cooler preheats primary and secondary air

Below: Partial view of 400-ft. all-welded kiln and lime storage silos at new plant of Chemical Lime Co., Bellefonte, Penn. This kiln, by Traylor, is probably the longest lime kiln in the world and is equipped with a 7- x 40-ft. Traylor-Cheesman multiple-tube type rotary cooler



Economical Methods of
MATERIAL HANDLING

By R. S. TORGERSON and BROR NORDBERG

ADEQUATE STORAGE and economical handling and reclaiming of rock products have become increasingly important in recent years. New plants and improvements to existing plants have been especially designed for efficient handling from the screens or grinding machinery.

There are several factors responsible, aside from the fact that every attempt is being made to reduce costs in delivering finished products to the customer.

Specifications for rock products are becoming complicated. The number of products and product sizes made generally require a greater number of material-handling and storage units.

Ground Storage

Larger plants, in a number of cases, have a greater volume of storage than was considered practicable a few years ago.

In the sand and gravel and crushed stone industries, the number of aggregate sizes produced far exceeds that of a few years ago. Specifications in many states require a definite percentage of crushed material in gravel aggregate for certain purposes. As many as eight or ten sizes of stone or gravel are being produced by many plants, not counting blends of various sizes. In plants furnishing material for several specifications and those which are reaching out for new markets, the storage systems have been designed to permit maximum flexibility in the blending of aggregates.

Ground storage, without any bin or silo storage, has been the solution for a number of plant operators. In the last few years, one of the country's largest sand and gravel companies, with 14 plants in the middle west, has been converting its plants from bin storage to ground storage.

Aggregates, in these plants, come direct from the screens to partitioned open "bins" on the ground, and reclaiming is done over a belt conveyor in a tunnel under the storage piles. Gates in the tunnel roof are adjustable to allow maximum flexibility in blending. Sand is settled in pockets spaced at intervals in the flume, and practically any sand grading is possible over the tunnel belt conveyor running parallel with and beneath the flume.

Radial System

A number of gravel plants have recently installed some form of open, radial storage system. Probably the latest of these is the new plant of the Anderson Sand and Gravel Co., Rockford, Ill.

This plant will be described in full in a later issue of ROCK PRODUCTS; but the storage system, designed to solve many problems which confront producers of aggregates, is worthy of mention here. The plant has a capacity of 80 to 85 cu. yd. of washed sand and gravel per hour and has been designed outwards from its storage.

This storage is a six-compartment Fred T. Kern No. 1 system similar to that installed earlier in the year at the plant of the Western Sand and Gravel Co., Spring Valley, Ill. It is claimed that "segregation," one of the difficulties of every aggregate producer, is eliminated at this plant. Other features claimed for this installation are unlimited flexibility in producing and blending for various specifications, low labor costs and provisions for an almost inexhaustible storage of aggregates.

The deposit is a pit operation. The washing and screening plant is superimposed upon the Kern storage system. A long belt conveyor carries the pit run material to the screens and sand recovery equipment. Gravel sizes are chuted to their proper storage compartments and the mortar sand and concrete sand fall into two other bins. One of the six ground compartments has been partitioned in this plant to provide for a seventh size.

This storage system is designed to allow for low cost reclaiming for ship-

View of a typical midwestern plant where large tonnages of stone are placed in open storage and reclaimed with comparatively low expense. This 25,000 ton storage pile of screenings has been placed with a 1-cu. yd. Sauerman drag scraper and is readily reclaimed by the same system. A second ¾-cu. yd. bucket handles crushed dolomite on the opposite side of the long conveyor

Cantilever type belt conveyor used by Portland Sand and Gravel Co., Portland, Penn., for intermediate storage over a tunnel reclaiming system. When the pit and primary crusher are not in operation, this stone is reclaimed and made into chips

ment. Directly below the screening equipment is a hexagonal "tower" in which the tail pulley of the reclaiming belt conveyor is housed. Adjustable gates, regulated by the operator through controls on the screening level, are opened when material is to be loaded into truck loading bins.

By accurate control of the gate openings any fraction of gravel from either compartment may be accurately blended with gravel of other sizes. One man is needed to handle the screening and the loading out from live storage. Total free flowing capacity of the storage system is about 1500 tons.

A 20-in. belt conveyor, 135-ft. centers, places aggregates in any of six truck-loading bins, which have a combined capacity of 250 tons.

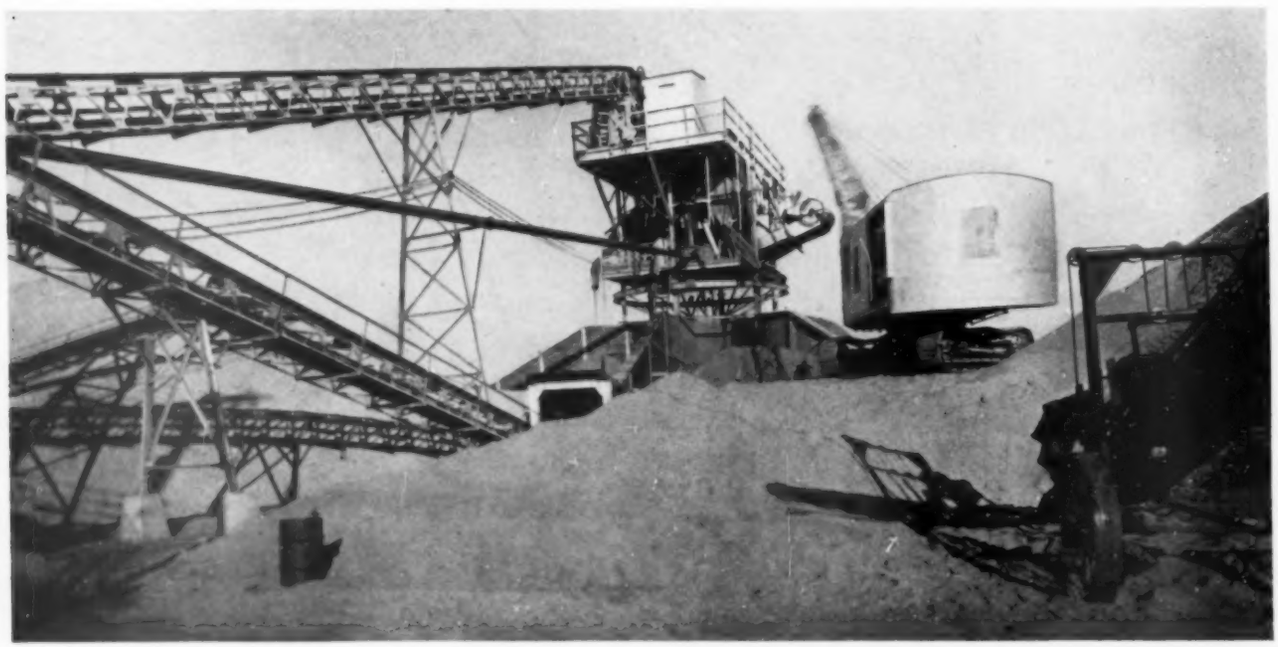
The plant when entirely completed will have a total storage capacity of 100,000 tons, including the free flow storage. Temporarily, a Northwest 1-cu. yd. dragline is handling aggregates from live to dead storage and the reverse.

At this writing, about 10,000 cu. yd. of stripping is being used to build a dike, or retaining wall, to limit the dead storage. Track is to be laid around the storage system on top of the dike, and a reconditioned 12-ton Plymouth locomotive and pulley tower will travel around the dike for handling aggregates. By means of movable pulleys on the tower and the storage ring, a Sauerman 1-cu. yd. scraper will handle aggregates from live to dead storage and back.

One of the main advantages of this type of storage is the tonnage of aggregates that may be stocked during the regular operating season. In an ordinary plant with an average amount of bin storage, operation of the plant becomes expensive when the bins are full. Either the plant has to shut down or material must be taken from the bins by truck or railroad cars and stockpiled. Loadings from stock must be made by portable loader or crane into trucks, cars or truck-loading bins, or by some other system.

At the plant of the Anderson Sand and Gravel Co., operations can continue regardless of the amount of material shipped, and when sufficient stockpiling has been placed, the plant may be shut down for long periods of time and shipments will continue from stock by operating the reclaiming belt conveyor.

For winter operation, a hot air heater is to be installed in the hexagonal chamber housing the tail pulley of the reclaiming belt conveyor. Hot air from the heater will penetrate into the live storage piles of material through ¾-in.



Radial ground storage system of the new Anderson Sand and Gravel Co. plant at Rockford, Ill. The top conveyor delivers aggregates to the screening plant which is superimposed upon the storage system. The dragline shown is being used temporarily in handling sized aggregates from and to live storage. Reclaiming for shipments is done over the belt conveyor entering the tunnel

ducts spaced at 6-ft. intervals in the chamber walls.

Reserve Storage of Oversize Gravel

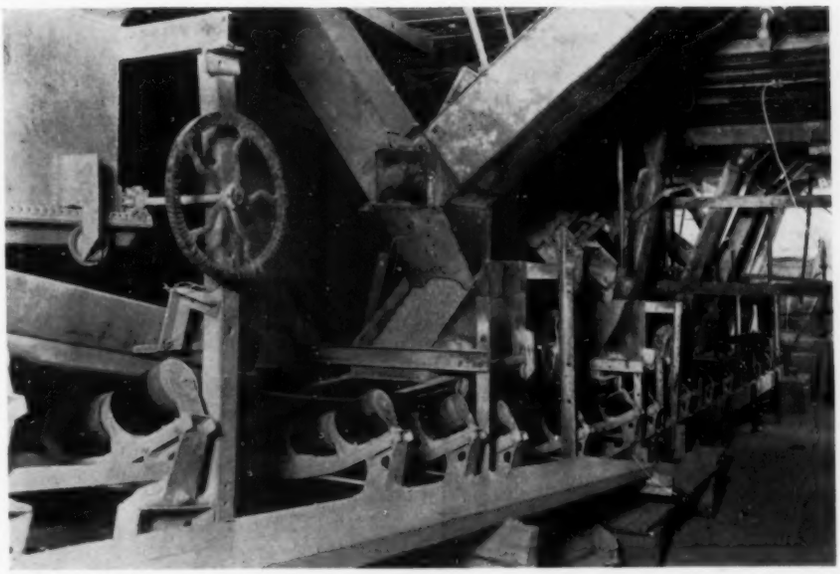
The new plant of the Portland Sand and Gravel Co., Portland, Penn., has added ground storage in addition to bin storage, not as storage of the finished product but as a reserve stock of oversize gravel from which to make chips. The stockpile has been provided so that chips may be produced without working the pit deposit or operation of the primary crusher.

During the regular run of material from the pit and through the crusher, plus 6-in. stone is broken once through the Farrel-Bacon primary crusher. The crusher throughs are carried over a 24-in. belt conveyor, 104-ft. centers, and are transferred to a cantilever belt conveyor (24-in. belt) on 74-ft. centers and placed in open storage. Stone is reclaimed, usually when regular plant operation is curtailed, over a 74-ft. centers belt conveyor in a tunnel beneath the stockpile and is run through the plant for recrushing and sizing.

Bin Storage

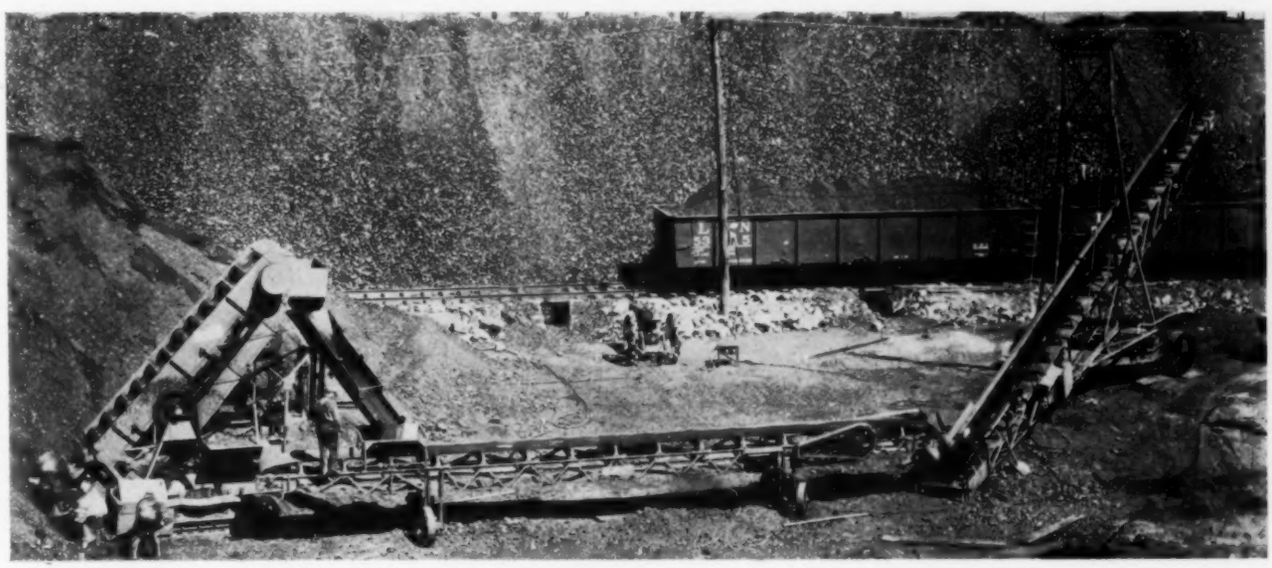
Bin storage, especially in the larger aggregates plants, is in a number of cases being increased and the number of storage units is greater, to accommodate additional sizings. For blending, belt conveyors, (in a number of large plants), are being installed to take aggregates from bins in exact proportions to the loading tipples.

The Independence, Mo., stone plant of the Stewart Sand and Material Co. is an excellent example of a large capacity plant with a bin storage system enabling accurate recombining of stone sizes from any of 18 bins. This past year, storage has been increased by 1000 tons in four bins, to provide for an enlarged number of gradings for which a market has been found. Stone sizes from any of the bins are fed to the loading-out belt conveyor (360-ft. centers) below the bins through accurately-calibrated gate feeders so that exact grading specifications may be maintained on this belt. And, as is typical practice in many plants, the stone is again cleaned over a vibrating screen before entering the freight cars.

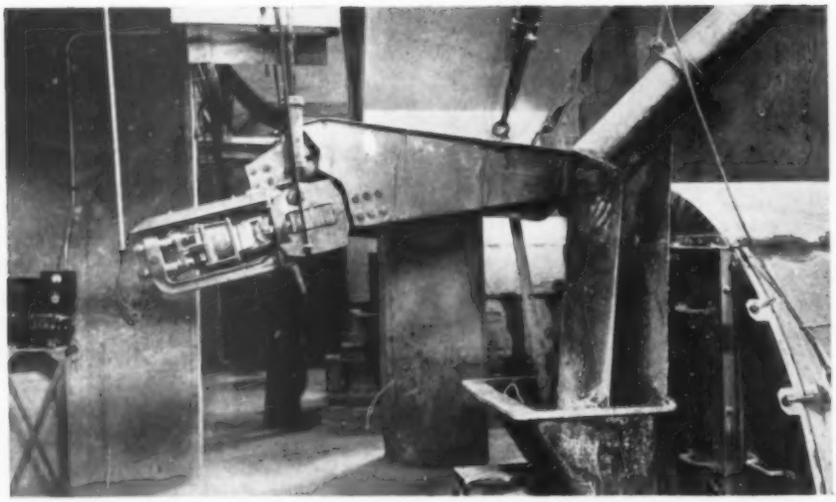


Reclaiming belt conveyor beneath the storage bins of the recently improved stone plant of Stewart Sand and Material Co., at Independence, Mo. This installation is typical of methods used to accurately blend sizings of aggregates from bins to a loading out conveyor, and to give necessary flexibility in meeting specifications

At the new plant of the Pennington Trap Rock Co., Pennington, N. J., there has been installed a simple arrangement for blending, that, incidentally, also serves as a means of washing stone when required. A short horizontal shuttle conveyor (24-in. belt) has been installed on one side of the bins just below the seven discharge chutes from the bins. Adjustable openings are provided to allow exact gradings of material from the bins on this belt conveyor. The belt, in traveling one direction, discharges into trucks or cars. By reversing its direction of travel, stone discharges to a revolving wash-



Haiss bucket loader and portable conveyors loading cars direct from storage, a procedure which might be applicable to producers of aggregates who carry great reserves for large contracts. In this installation, coal was placed into storage by the conveyors and is being reloaded into cars at the rate of 300 to 400 cu. yd. per hour



One of the rapidly-developing refinements in the rock products industries is the use of vibrating feeders for controlling and regulating the flow of materials to various processing machinery. Here is shown the application of Jeffrey-Traylor vibrating equipment to the feeding of limestone to a Kominuter in a cement plant

ing screen and into cars or trucks after passing over a drain chute.

Carbon Limestone Co., Hillsville, Penn., has developed an extensive market for agricultural stone, and for this purpose has constructed a storage bin of its own design that is successful in handling finely-pulverized stone and rendering adequate service to farmers in times of peak demand.

The new bin has a capacity of 18,000 tons and is of reinforced-concrete construction, 90 x 150 ft. in plan and 25 ft. high. Agstone is carried from the mill building by belt conveyor and transferred to a 12-in. Stephens-Adamson enclosed screw conveyor traveling overhead practically the length of the building and in the center. At 14-ft. intervals, discharge openings are provided for discharging the agstone on the floor of the bin.

The loading out system is designed to handle 250 tons of agstone per hour. Six concrete troughs were cast in the concrete floor to house six equally-spaced 12-in. Stephens-Adamson screw conveyors traveling the length of the building and extending beyond the building limits.

The top of each screw conveyor consists of a series of interlocking 2-ft. square steel covers, which may readily be slid out from one another as the storage pile is worked back toward the end of the building. The "flow" of the fine agstone is into the open top conveyors.

The six conveyors discharge to two transverse 18-in. Stephens-Adamson screw conveyors, discharging to a common elevator pit. A 50-ft. Weller bucket elevator places stone in a 195-ton bin, from which it is weighed and placed in trucks. This system is effective in providing a reserve for peak orders and permits continuous operation of a Hercules mill.

Silo Storage

Silo storage of cement has been increased at plants, in total volume as well as in the number of storage units. Cement companies are now manufacturing more special cements and some plants have set aside silos for storage of special cements not yet manufactured at that particular plant.

"Buyers Market" specifications have been responsible for large investments by cement concerns, requiring that separate bins be set aside for cement to

Trucks for hauling aggregates are equipped with cement buckets to deliver mix proportions in contracts being filled from the new plant of the Gwynns Falls Stone Corp., Cowendon, Md. In this particular case the producer is also a contractor

be used on special projects. Such expenditures do not appear to be justified when one considers that the cost of erecting silos means to the cement manufacturer about one dollar per barrel of stored cement capacity. It is not uncommon for a silo of from 10,000 to 15,000 bbl. capacity to be held one-third full for long periods of time because a certain testing laboratory has reserved that silo for a particular contract.

In the average plant, with enlarged storage capacity, handling of cement is done by pump or screw conveyor and elevator systems into the packing machine bins. A later article in ROCK PRODUCTS will describe a plant of one of the larger cement corporations where cement is handled direct by screw conveyors to the packing machines with an overflow bin provided, complete with indicating controls, to take the surplus cement when the packing machines are not in operation. At another improved cement plant, portable bagging machines with individual, and portable, dust collectors are being installed.

Diesel-powered trucks, with 6-cyl. Cummins engines and capacities of 11 tons, are used for long distance hauling of aggregates by the Worden Sand and Gravel Co., Bedford Hills, N. Y. Fuel costs are cut one-third so it has been profitable to operate a side-line hauling business

Lime Storage Capacity Increased

Heavy storage capacities for stone as well as lime have been provided in lime plants built in 1937. Close control of stone feed sizes is exercised at the new rotary kiln plants for the purpose of making a uniformly burned product.

A new development in the handling of lime to storage has been the application of spiral chutes for placing lime in the three 66-ft. concrete storage bins of the Chemical Lime Co., Bellefonte, Penn. These chutes, manufactured by Robert Holmes and Bros., Danville, Ill., have been successfully used in the coal industry and are apparently doing a good job of lowering the lime to the bottom and lower levels of the storage bins with very little breaking up of particles and dusting.

The design of the carrying surface is formed much on the order of the bowl of a race track, without a retaining wall on the inside edge. This feature is incorporated to allow the lime to slide gently on to the peak of the pile without dropping.

Trend in Material Handling

The only decided trend in material handling is probably in refinements to methods already existent in the plants. Producers are more cognizant of the value of a uniform flow of materials to screens, crushers, grinding mills, and other equipment. Feeders have been

A group of 12-cu. yd. capacity trucks operated by the Kingston Trap Rock Co., Kingston, N. J., in hauling crushed stone over the entire state of New Jersey and into metropolitan New York. In all, thirty 6-cyl. White trucks equipped with Universal bodies are in service

Remote control unloader (Fuller Co.) withdrawing bulk cement from a river barge. The remote-control feature allows the operator to start, stop and govern all movements of the machine from a safe distance

perfected to the point where plant operators can now control the feed of products to various machines, and the operating results and the final products have been improved.

Feed Devices

Vibrating feeders have gained wide acceptance in the lime, cement and allied industries, particularly in 1937, as control and regulating devices. A number of cases could be mentioned where lime and cement plants have had success in the application of such devices. Such installations with which we are familiar have been installed to feed limestone to Kominuters, for bypassing fines to hammer mills, for proportioning cement, lime and ground limestone ahead of a grinding mill, for regulating the feed of stone or fine products from hoppers or bins to conveyors, etc.

Another practice that has gained acceptance quite extensively in 1937 is the use of bin level indicators which automatically indicate when bins are full or need to be filled, some of which are operated to automatically start and stop conveyors which feed the bins. Applications have been made on coal mill feed bins, bins feeding lime hydrators, lime storage bins, packing machine bins and the like where an uninterrupted supply of material is essential. A number of these installations have been made by the Bin Dicator Co., Detroit, Mich.

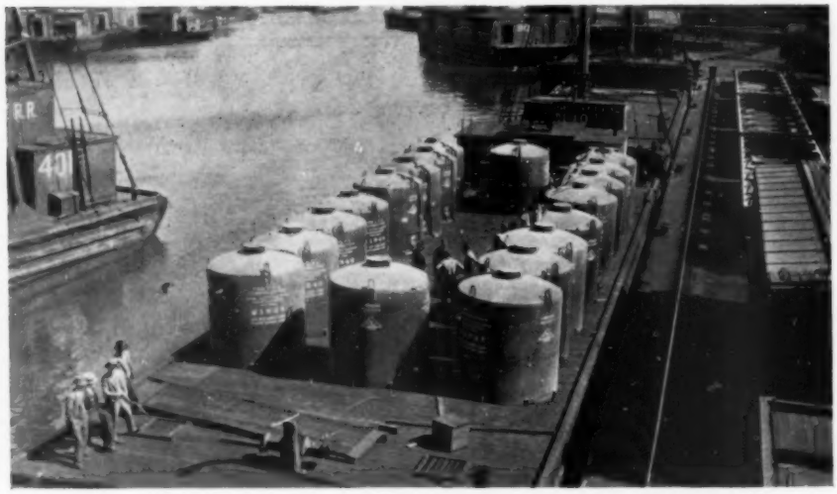
A feature of the H. E. Millard rotary kiln lime plant, is the method of handling limestone and lime to storage and from storage. The plant layout is such that materials flowing over belt conveyors do not always go to storage, but go direct to their destination and only go to storage for reclaiming when there is an oversupply, or when machinery using these materials has been stopped.

Conventional methods of shipping rock products are still in use, although there are numerous producers who have deviated in order to cut costs. Truck hauling in company-owned trucks is probably on the increase and larger capacity trucks have widened the shipping range in such equipment.

More Trucks To Be Used

The use of large capacity trucks will likely be considerably increased due to higher railroad freight rates. Operators of plants, and particularly those located close to state lines will, in a number of cases, be placed at a competitive disadvantage when interstate freight rates are increased. Business across the line will be lost in many cases, and the only way to retain this business will be to take aggregates direct from the bins and unload them on the job site.

Spiral chutes of the type installed by Chemical Lime Co., Bellefonte, Penn., to gently place pebble lime into deep silos



Shipping bulk cement by barge in Kennedy air-activated containers. These shipping units are designed to eliminate dust loss in the loading and unloading of bulk materials and it is claimed that the discharge of material is readily accomplished

Some Speculations On the

CHARACTER OF PORTLAND CEMENT

By NATHAN C. ROCKWOOD

SOME REALLY REVOLUTIONARY developments have occurred in the American portland cement industry in 1937. We can hardly call them evolutionary because in a few instances they are a complete reversal of former points of view.

There are and always have been so many variables in making and placing concrete that for years portland cement manufacturers were able to keep attention focused on all of these except the cement itself. No one could tell them anything about cement or how to improve the manufacturing process except a manufacturer himself—and all cement, for commercial reasons, just had to be "standard."

The adoption of the autoclave test as a manufacturing control device, in February, 1937, is of course an outstanding example. In July, 1937,* we have a well-known chemical engineer in the cement industry writing:

"The proportion of cements of extremely high autoclave expansions as thus far discussed is very low, yet such cements certainly have reached the market. Is it any wonder then that we have instances of concrete disintegration due to cement expansion? The limited number of such occurrences is partially explained by the fact that, under most service conditions, the potentially highly expansive forces in question either do not develop, or are offset by opposing forces, or are relieved by plastic flow of the concrete."

Such a statement would have been rank heresy a few years ago.

The history of the autoclave test is interesting and instructive. It was first adopted as a purchaser's specification in 1911 or 1912 by the Delaware, Lackawanna & Western R. R. Prior to that the railway had constructed the Paulins Kill viaduct in New Jersey, with a cement which had survived the autoclave test 100 percent. In 1912, H. J. Force, of the D. L. & W. R. R. described, explained and advocated the test in *Engineering News*. It was immediately denounced by the cement industry. Shortly thereafter Mr. Force presented a paper on the same subject to the American Society for Testing Materials. The discussion was vituperative. Then *Engineering News* editorially disowned any responsibility for fostering the test and questioned its value. There followed a series of letters published in *Engineering News*, one pointing out that the test was old —had in fact been advocated by the elder Dr. Michaelis in Germany in the 1870's and rejected by German cement manufacturers as not in any way related to the experience cement would undergo in practice. G. J. Ray, then chief engineer of the D. L. & W. R. R. defended it. The autoclave test was laid to rest about two years later by Wig and Bates, of the U. S. Bureau of Standards, as proving nothing.

Mr. Force, in his discussion of the test, did not attribute failures to "free" lime or "free" magnesia as such. In fact he believed these were not the cause. He attributed failures to too coarsely ground raw material. He thought such particles were given a glaze in burning which protected a core of lime or something else from ready hydration when the concrete was mixed and placed; and that this glaze subsequently broke through and permitted delayed hydration of the interior. While the D. L. & W. R. R. specification required a finer ground cement than was standard practice at that time, Mr. Force clearly indicated that the primary trouble was in the preparation of the raw materials and the burning. It is perhaps true that there was no satisfactory test for free lime at that time—but would any test for free lime in clinker have shown the lime if it were protected by a glaze or glass coating as Mr. Force suggested was the case? The present theory is, of course, that the lime and magnesia may be rendered inert by dissolving them in glass—but that means the whole particle must be glass, not merely coated with glass.

G. J. Ray, the former chief engineer, is now vice-president and general manager of the D. L. & W. R. R. I wrote to him recently about his experience with concrete made of cement which passed the autoclave test in 1912. He wrote in reply:

"The service records of concrete placed by the Lackawanna Railroad during the time that all cement was purchased subject to passing the autoclave test indicate that no mistake was made in adhering to that test.

The Paulins Kill viaduct, completed in 1910, was the first large structure built by the Lackawanna known to be constructed with cement that passed the autoclave test one hundred percent. At that time, the test had not been adopted as our standard, but was being carried out on much of the cement purchased. This viaduct was carefully and well constructed in every respect. It is, today, after 27 years' service, in absolutely perfect condition. I do not think there is a spot on the structure as big as a man's hand that shows any indication of deterioration.

The autoclave test was adopted as the standard test for cement purchased by the Lackawanna Railroad in 1911 or 1912, and the specifications for all concrete in connection with the construction of the Clarks Summit-Hallstead cut-off required the autoclave test for cement.

As chief engineer of the railroad, the writer's judgment in attempting to build with concrete such a large structure as the Tunkhannock viaduct was seriously questioned. With this in view, he could not be fairly criticized for adopting a cement specification that would insure the construction of so large a structure with the safest possible cement.

Both the Tunkhannock and Martins Creek viaducts were completed in 1915, and while I cannot say what might have happened had they been built with cement that did not meet the autoclave test requirement, their condition today is the best of evidence that no mistake was made in specifying that test."

How another specification writer has set out to improve the manufacture of portland cement without the benefit of an autoclave test is given on the following three pages. He, too, started with a satisfactory concrete and has tried to work back to a satisfactory cement. Logical?

Journal of the American Concrete Institute, September-October 1937, "The Autoclave Test and Interpretations," by Roy N. Young.

Chemists' Corner

Board of Water Supply, City of New York

NEW SPECIFICATION for CEMENT

NO SPECIFICATION for portland cement, including those written for United States government work, has created so much interest and comment in the cement industry, as that prepared by the Board of Water Supply of the City of New York, of which Thaddeus Merriman is chief construction engineer, for the new Catskill Aqueduct. Mr. Merriman has long been considered an expert on cement and concrete, and this specification represents the result of many years' experience and observations. With whatever changes may be made from time to time in the next five or six years, this specification will cover the purchase of about 6½ million barrels of cement. The amount involved alone makes this specification of much significance.

It will be noted that this specification covers some phases of manufacture as well as quality. It contains no "specific surface area" requirement; it does not call for as fine grinding as most new specifications; it requires at least two percent *to be retained* on the 200-mesh. It will prevent cement manufacturers from using flue dust as a raw material. It introduces a sugar solubility test designed to insure a completely burned clinker with a minimum of uncombined lime and magnesia. In addition it requires a pyrometer record to insure burning temperatures of 2700 deg. F.

Herewith is the specification complete, except for three sections relating to shipping, handling and storage on the job, which, while they are interesting and in keeping with the rest of the specification, do not differ so much from the ordinary. Included is a record of 35 cements tested as to their eligibility to meet the tests specified. The table is interesting in showing again, in another way, the great variation in "standard" portland cements, with the exception of the last two in the table, which are puzzolanas.

SECT. 48.1 Under Item 48 the contractor shall furnish, deliver and place in the work portland cement that has been manufactured at established plants of such recognized capacity and quality of output as to insure a product at least equal to that hereinafter specified. Unless otherwise permitted, cement from not more than three plants shall be used and, in general, only the product of one plant shall be used at the same time in any section of the work. Within 15 days following the notice to begin work, the contractor shall submit for the approval of the engineer the names of the plant or plants from which he proposes to furnish the cement and no cement shall be furnished from any plant until it has been approved. At the same time, he shall also furnish to the engineer an estimated schedule of the monthly deliveries he will require from each of the said plants during the ensuing four months. This schedule shall be revised by the contractor every 60 days thereafter.

SECT. 48.2 The cement and the clinker from which it is made will be subjected to thorough inspection, to tests, and to frequent analyses as provided in the following sections. The cement when delivered and used on the work shall be dry and free from lumps and caking.

Requirements of Manufacture

SECT. 48.3 The raw materials from which the cement clinker is made shall be thoroughly blended and finely and uniformly ground; either the dry or the wet process may be used. The flue dust from the kilns shall not be returned to the raw mix, but shall be rejected unless the nature of the raw materials and of the flue dust is such that the alkalinity of the finished cement is less than 4.0 and its content of free alkali is less than 4.5. (See Section 48.8 for test procedures). The kilns shall operate at about 2,700 deg. F., and a continuous record of the temperature shall be kept. A regular record shall also be kept of the rates of kiln rotation; these records shall be available to the engineer and are called for in order to insure the greatest possible uniformity of kiln output. The speed of kiln rotation and the kiln temperature shall be controlled and coordinated so as to produce a hard and completely burned clinker in which the combinations between the several oxides it contains have been substantially completed. Only a minimum of water may be used as an aid for cooling the clinker while it is hotter than dull red; at all other stages, it shall be kept dry and protected from the weather. In general, the clinker shall be ground immediately after it has been made; occasionally, it may be stored, but not for a period longer than six weeks. Grinding aids shall not be employed unless they have been declared to and approved by the engineer. No water or steam shall be permitted to come into contact with the cement or applied to it at any stage of its manufacture. The gypsum or other source of SO_3 shall be reasonably dry when mixed with the clinker before grinding. No material or admixture shall be added to the raw material, to the clinker, or to the cement at any stage of the manufacturing process without the approval of the engineer, except that gypsum, anhydrite or plaster may be added in quantities sufficient to secure the necessary percentage of sulphuric anhydride. Water may be added to the clinker only as above provided.

SECT. 48.4 The cement shall be ground so that at least 90 percent, but not more than 98 percent, by weight, will pass the standard No. 200 sieve. These limits shall not be exceeded. Pats of neat cement, in the steam test for soundness, shall remain firm and hard and shall not distort, check, crack or disintegrate. Similar pats kept in the moist closet for seven days shall remain firm and hard and unchanged. The cement shall not develop its initial set under the Vicat needle in less than 45 min., or in less than 60 min. when the Gilmore needle is used. The final set shall be attained in not more than eight hours.

SECT. 48.5 The average tensile strength of not less than three standard briquettes made of neat cement and mixed to normal consistency shall not be less than the limits stated in the following table:

Age at test in days	Storage of briquettes	Tensile strength, lb. per sq. in.
1	1 day in moist closet....	350
7	1 day in moist closet, 6 days in water.....	600

The average tensile strength of not less than three standard mortar briquettes made of one part of cement and three parts of standard Ottawa sand, measured by weight, shall not be less than the limits stated on the next page:

Age at test in days	Storage of briquettes	Tensile strength, lb. per sq. in.
7	1 day in moist closet, 6 days in water.....	275
28	1 day in moist closet, 27 days in water.....	375

The average tensile strength of the mortar briquettes at 28 days shall be at least 15 percent greater than the average tensile strength at 7 days.

SECT. 48.6 The composition of the cement shall be such that the chemical analyses will show it to meet the limits stated below:

The percentage of silica (SiO_2) shall not be less than 21.50; the percentage of alumina (Al_2O_3) shall not be greater than 5.60; the percentage of magnesia (MgO) shall not be greater than 4.00; the percentage of sulphuric anhydride (SO_3) shall not be greater than 1.75; the percentage of loss on ignition shall not be greater than 0.90; the percentage of insoluble residue shall not be greater than 0.30; the ratio between the percentage of alumina (Al_2O_3) and the percentage of ferric oxide (Fe_2O_3) shall not be greater than 1.60 nor less than 1.20; the ratio between the percentage of lime (CaO) and the percentage of silica (SiO_2) shall not be greater than 2.90; the molecular ratio (Colony's ratio) shall not be greater than 2.60 unless approved by the engineer. This ratio is obtained by dividing the molecular ratio of the calcium oxide by the sum of the molecular ratio of the silica, the alumina and the ferric oxide.

Chemical Analyses

SECT. 48.7 All chemical analyses and physical tests specified in the preceding sections shall conform to the following procedures: Chemical analyses shall be made by the methods prescribed in the U. S. Bureau of Reclamation Specification 566 for cement for the Boulder Dam, while the physical tests shall follow the methods and procedures of Sections 13 to 45 of Specifications C77-32 of the A. S. T. M., entitled "Standard Methods of Sampling and Testing Portland Cement." All limits prescribed in these specifications include all so-called "tolerances." At least 14 days shall be allowed for the completion of the 7-day tests, and the 28-day tests shall be completed within 32 days.

SECT. 48.8. The alkalinity of the cement shall not be greater than 4.0 and its content of free alkali shall not exceed 4.5. These characteristics shall be determined as follows: Weigh out 800 grams of cement and put into an enameled saucepan with 500 c.c. of distilled water. Stir frequently for two hours, then filter through large folded filter paper for 10 minutes. If filtrate is not clear, refilter. Titrate 25 c.c. of the filtrate with N/2 HCl, using methyl orange as the indicator. The number of c.c. of acid required to neutralize the filtrate to the methyl orange end point is the measure of the alkalinity.

The free alkali content of the cement shall be determined as follows: Measure out 100 c.c. of the filtrate obtained in the alkalinity test of the preceding paragraph into a small beaker and add 30 to 35 c.c. of a saturated filtered solution of $Ba(OH)_2$. Let stand, filter and wash with H_2O. Pass CO_2 in the filtrate for five minutes. Let stand, filter and wash the precipitate with H_2O. Heat to boiling and, if a precipitate forms, filter it out. Then boil the total filtrate plus wash water down to about 50 c.c., filter it and make it up to 100 c.c. with distilled water. Now take 25 c.c. of the solution and titrate it with N/2 HCl in the presence of methyl orange. The number of c.c. of the acid required to neutralize the 25 c.c. to the end point of the methyl orange is the measure of the free alkali content. Both of these tests are to be made at room temperature.

SECT. 48.9 The cement will be subjected to the sodium sulphate test. In this test the slabs shall, at the end of 28 days, remain firm, hard and strong and shall show no sign of disintegration or softening. Slight warping or small surface cracks on the edges and corners will not be ground for rejection. The test procedure is as follows: One hundred and fifty grams of the cement are mixed with 43 percent by weight of water and stirred for one minute by a rotary stirrer in an earthenware jar about 3 in. in diameter and 4 in. high. Near the bottom of this jar is a ⅜-in. diameter hole closed with a cork. When the stirring is complete the mixture is rapidly poured, by withdrawing the cork, onto a sheet of moistened paper as made by the Paterson Parchment Paper Co., of Bristol, Penn., 30-lb. 400 Parchment, white, 24 in. by 36 in., 34.0-lb. per 500 sheets, or equal, cut to 8-in. by 10-in., the paper being supported on a clean glass plate 8-in. by 10-in. in size. On this paper at convenient positions are placed six 3/16-in. steel balls held in position by paraffin shavings. The poured slab assumes an oval shape about 4-in. by 8-in. in size. A second glass plate, also having a moistened parchment paper on its face, is then gently lowered into position on the steel balls so as to exclude all air bubbles. A light weight (two soundness pats are sufficient) is then placed on top of the upper glass plate and the assembly carefully put into the moist closet. Twenty-four hours thereafter the assembly is put into the water storage tank (circulating water). After another twenty-four hours the glass plates and papers are removed and the slab carefully sawn to size, 2-in. by 4-in., with a hack-saw and templet, it being kept under water except during the sawing process. At this time a small hole is also drilled through the slab at ½-in. from one end and on its center line. This hole serves to suspend the slab in the test solution. The slab then goes back into the water storage tank for 24 hours, when it is removed and hung on a copper hanger in a 2-quart Mason jar containing 1,500 c.c. of a 10-percent, by weight, solution of anhydrous sodium sulphate (Na_2SO_4). The slab is suspended so that its top is one inch below the surface of the solution. About ten drops of an alcohol solution of phenolphthalein are added to the sulphate solution and, after the slab has been placed therein, it is titrated every 24 hours to the phenolphthalein end point with 6N sulphuric acid. During the test the jars are covered with glass tops without washers, except when the titration is being done. During that process the slab is removed and hung in an empty jar close at hand. A daily record of the quantity of acid added is kept. A sudden increase in the quantity of acid consumed is an indication of failure of the slab before cracks visible to the eye appear. This test is to be made at room temperature.

SECT. 48.10 The sugar solubility of the cement shall not be greater than 8.0 to the phenolphthalein end point, nor greater than 10.0 to the final clear point. These values shall be determined as follows: A sample of about 100 grams of the cement is passed through the 200-mesh screen and put into a glass bottle closed with a rubber stopper. From this bottle 15 grams are then weighed out and placed into a Nessler tube containing 100 c.c. of a 15-percent solution of cane sugar in distilled water (commercial granulated sugar such as "Jack Frost"); this solution shall not be more than three days old. The tube and its contents are then quickly shaken by hand and placed on a wheel revolving about 60 times per minute. At the end of about 1 hr. and 50 min. the mixture is poured into a filter paper and funnel and allowed to filter for 10 min. when the beaker containing the filtrate is removed. (In case the filtration time of 10 min. is too short to produce a volume of filtrate of 30 c.c., it may be lengthened by shortening the time of shaking, but the total time from the putting of the sample into the solution to the end of the filtration must be exactly two hours). Twenty-five c.c. of the filtrate is now titrated with N/2 HCl in the presence of phenolphthalein and the number of c.c. of acid to the end point is the first measure of the sugar solubility. At this stage of the test, in the case of a thoroughly burned cement which has been kept dry, the solution will be practically clear and only traces of ferric oxide and alumina will be in suspension.

In the case of an under-burned cement, or one which has been exposed to moisture, the solution will be heavily clouded and the end point must be approached slowly and with caution. When so performed, the phenolphthalein end point can be definitely determined, as the color changes from light pink to yellow. The titration is then continued until the solution is crystal clear and nothing remains in suspension. The total number of c.c. of acid from the beginning of the titration to this final clear point is the second measure of the sugar solubility. This test shall be made at room temperature. In addition to disclosing the quality of the cement as above stated, this test further indicates the character of the hydration products which will be realized in the completed concrete.

SECT. 48.13 The engineer shall be notified by the contractor when the cement is to be manufactured, and the engineer shall have the liberty at all times to inspect the materials, the processes of manufacture and the laboratory records of analyses and tests made at the cement works, and to supervise the packing. Samples will be taken at the place of manufacture by the engineer and sent to the Board's laboratory, where the tests and analyses herein specified will be made. Samples shall be stored and shipped in moisture-proof, air-tight containers which will be furnished by the Board. These containers shall be crated, ready for shipment, by the contractor and shall be delivered by him to the express company. Express charges will be paid by the Board.

SECT. 48.14 The contractor shall notify the engineer when orders for cement are placed and shipments are to be made in ample time (at least 48 hours) to enable him to have his representative present to observe the burning of the clinker, the manufacture of the cement, its loading for shipment and to obtain the necessary samples. In case additional tests become necessary, the contractor shall re-handle the cement in the storehouse for the purpose of obtaining samples as directed.

In general, the cement shall be sampled from the conveyor belt at the mill by a continuous sampler, one sample being taken for every 200 bbl. or more as determined by the engineer. Each sample shall weigh 5 lb. If sampled from the bin proper, tubes shall be used. If a bin is full, it shall be sampled from the discharge openings. The methods of sampling must at all times be approved by the engineer. All cement stored at the mill shall be kept in sealed silos or other approved bins.

Cement kept in store at the mill for more than six months may be re-tested. Cement failing to pass such tests shall be rejected. If any cement proves unsatisfactory and portions of it have been used in the masonry, such masonry shall be ordered removed and replaced with masonry built of acceptable cement at the contractor's expense. Test-cylinders from concrete or mortar being used in the work shall be made by the contractor at any time for purposes of test, if so directed.

SECT. 48.15 Cement may be rejected at the discretion of the engineer if it fails to meet any of the requirements of these specifications. Cement may be accepted without awaiting the results of the 28-day tests when, in the judgment of the engineer, the 7-day tests are met and there is definite justification, based on experience and actual plant performance, that the 28-day tests will be satisfactory.

SECT. 48.17 The contractor shall employ competent storekeepers who can speak and understand the English language, who shall have charge of the cement storehouses and keep suitable records of the delivery and use of all cement. Copies of these records shall be furnished the engineer at the close of each day's work, showing in such detail as he may require, the quantity of cement used during the day at each part of the work.

SECT. 48.18 The number of barrels of portland cement of the kind and quality herein specified, which has been furnished and delivered to the work by the contractor and used in accordance with this contract, shall be paid for under Item 48. Four bags, each containing 94 lb. net of cement, shall, for purposes of payment, constitute a barrel of cement weighing 376 lb. net. No payment will be made for any excess weight over 376 lb. net per barrel. Shipments in which more than 5 percent of the bags weigh less than 94 lb. net may be rejected. Bulk cement shall be weighed under the supervision of the engineer on approved scales furnished by the contractor and tested by the engineer. Every 376 lb. shall constitute a barrel. The price per barrel stipulated for this item shall include all labor, equipment, materials, expenses and costs, not properly to be classified under any other item or items, necessary to furnish, deliver and place in the work portland cement of the kind and quality specified and in the manner herein set forth. Cement used for replacing condemned work and filling unauthorized excavations, and that used for the purposes of the contractor, shall not be included for payment, it being considered that the cost of furnishing and delivering all such cement has been included in the prices stipulated for the various other items of the contract.

TABLE OF TESTS OF SOME TYPICAL PORTLAND CEMENTS

	Sugar Solubility		Alkalinity		Free Alkali	
	No. of c.c. N/2 HCl required to titrate 25 c.c. of sugar filtrate					
No.	Phenolphthalein	Clear Point	Phenolphthalein	Methyl Orange	Phenolphthalein	Methyl Orange
1	38.2	56.8	3.1	3.3	0.7	2.1
2	40.9	61.7	4.7	4.9	2.8	7.0
3	31.1	45.6	5.5	5.7	3.9	8.1
4	47.7	65.3	3.6	3.8	1.4	3.8
5	2.8	2.8	5.0	5.2	3.7	8.0
6	24.0	32.1	4.4	4.7	2.6	6.3
7	4.9	5.4	4.8	5.1	2.9	7.6
8	48.7	73.1	6.6	6.9	4.6	9.6
9	29.4	43.0	2.8	2.9	0.8	1.9
10	37.8	58.2	5.2	5.4	3.6	7.8
11	3.2	3.3	3.1	3.2	1.0	2.2
12	38.8	60.6	5.3	5.5	4.1	8.7
13	3.4	3.4	4.6	4.7	3.0	6.6
14	3.6	3.9	3.5	3.6	1.3	3.2
15	41.7	60.9	3.4	3.5	1.2	3.0
16	48.6	70.1	2.4	2.5	0.2	0.4
17	22.8	33.9	5.4	5.6	4.3	8.5
18	33.0	52.3	3.7	3.9	1.6	3.5
19	44.9	66.1	4.3	4.5	2.3	5.4
20	41.2	57.8	4.0	4.2	1.6	4.1
21	40.1	58.7	4.0	4.2	1.6	4.2
22	43.7	62.8	5.9	6.2	4.4	9.4
23	46.8	66.5	4.6	4.8	2.5	6.1
24	6.2	6.7	5.6	5.8	3.9	9.6
25	38.7	53.4	*3.0	3.1	0.9	1.6
26	51.7	76.4	*5.5	5.8	4.7	10.4
27	52.9	73.3	6.8	7.0	6.2	13.0
28	9.3	10.9	6.8	7.0	7.3	16.3
29	4.7	5.0	3.3	3.5	1.0	2.7
30	31.7	43.6	3.6	3.7	1.1	3.0
31	14.1	16.8	3.4	3.5	0.9	2.7
32	11.1	12.5	*2.6	2.8	0.2	0.5
33	31.0	47.0	*2.3	2.8	0.2	0.6
34	3.6	3.9	*2.1	2.2	0.6	1.5
35	30.1	43.7	*3.2	3.6	1.6	4.3

*These samples when mixed with water for two hours produced a thick paste which was difficult to filter.

New Portland Cement Plant

GULF PORTLAND CEMENT CO., Houston, Tex., is building a plant on the Houston Ship Canal, to be ready to operate next April. It is said over a half a million dollars will be invested in it.

Kent B. Diehl, president and general manager of the new firm, says that all the latest methods and new developments in the industry have been employed in construction and equipment.

"Not only will Houston's new plant be the only one built in the United States during the present year, but it will also be the most modern cement plant in the world," he said, for publication.

"While very little information has been given out concerning our new plant, still the word has spread rapidly within the industry. Observers, engineers, technicians and cement men from all parts of the United States and from several foreign countries have come here to inspect the plant in all stages of construction, for many of the manufacturing processes as well as much of the equipment to be used in our plant represent sound and improved departures from old accepted methods.

"When completed our plant will have a daily capacity of 850 bbl. of highest grade portland cement. The operation staff will consist of 35 highly trained specialists in cement blending and manufacturing."

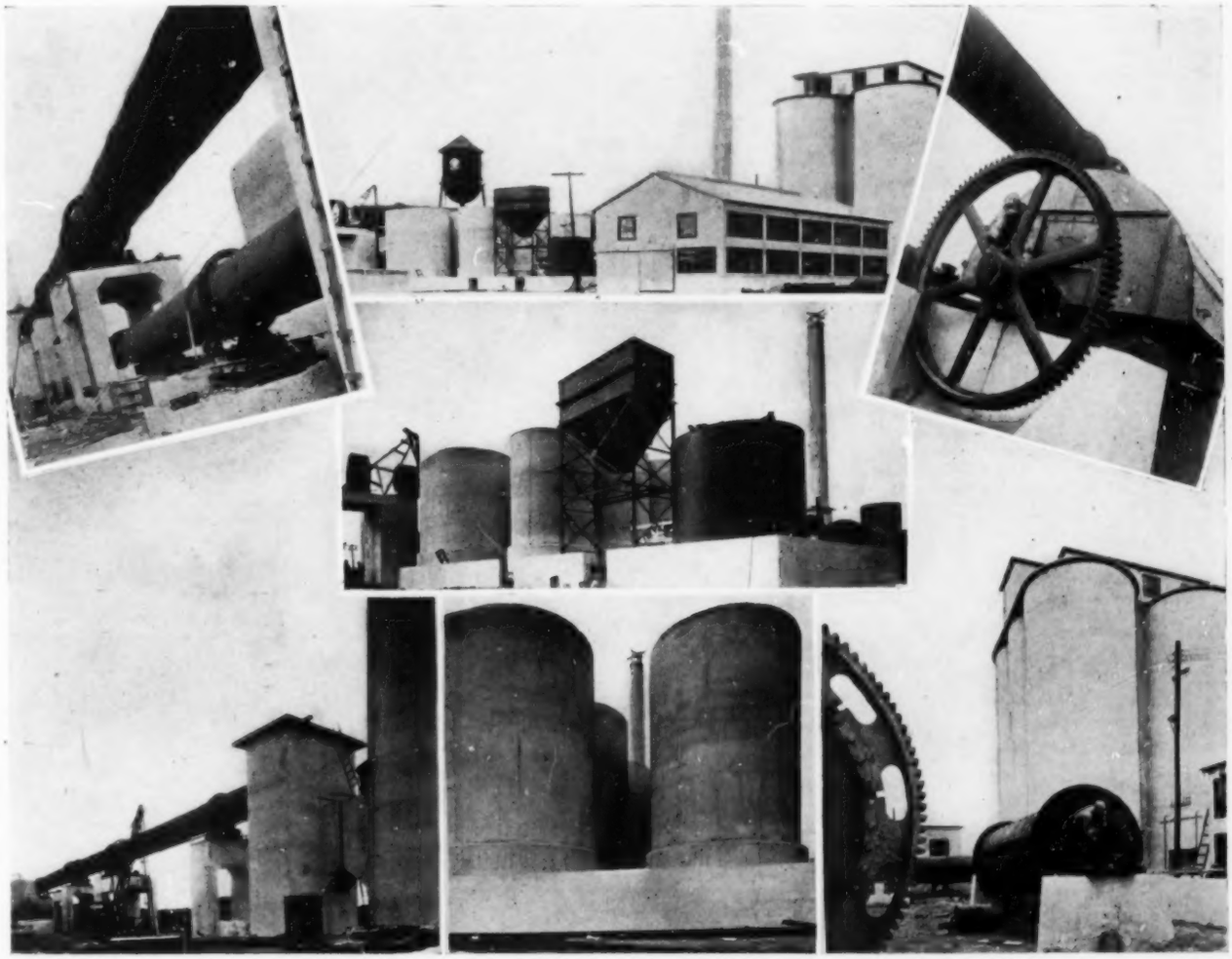
Mr. Diehl has been associated with the cement industry for almost twenty years. He worked his way through the university as a cement salesman. Following graduation with a civil engineering degree, Mr. Diehl took a position with the Ash Grove Lime and Portland Cement Co. as special engineer, later going to the Dewey Portland Cement Co., Kansas City, Mo., as field engineer.

Sensational development of oil fields in East Texas in 1930 found Mr. Diehl right in the heart of things. New fields were opening up almost every month. Major oil companies and countless independents were sinking wells more rapidly than ever before in history. The oil industry in Texas mushroomed into the billion dollar class and with it grew new, perplexing problems. Vital among these was the problem of finding a cement that could do one of the most important jobs in oil-well drilling.

Mr. Diehl assisted in solving many of these problems and made a name for himself in the great Kilgore and Longview fields. He continued working as a cement salesman and technical engineering adviser in the East Texas areas until 1935.

"It has been our determination throughout the formation of the Gulf Portland Cement Co.," Mr. Diehl said,

(Continued on page 118)



Top Left: 220-ft. rotary kiln and rotary cooler below; Top Center: general view of new plant from ship channel slip; Top Right: showing installation of newly perfected kominuter; Center: detail view showing installation of lower end of rotary kiln, concrete blending tanks and shell hopper; Lower Left: dust chamber, stack and upper section of rotary kiln; Lower Center: detail view of blending tanks with stack in background; Lower Right: installation of tube mills used for grinding and pulverizing shell. Giant silos shown in the background

LIME PRODUCERS' FORUM

Conducted by Victor J. Azbe, Contributing Editor, St. Louis, Mo.

Progress In The Lime Industry

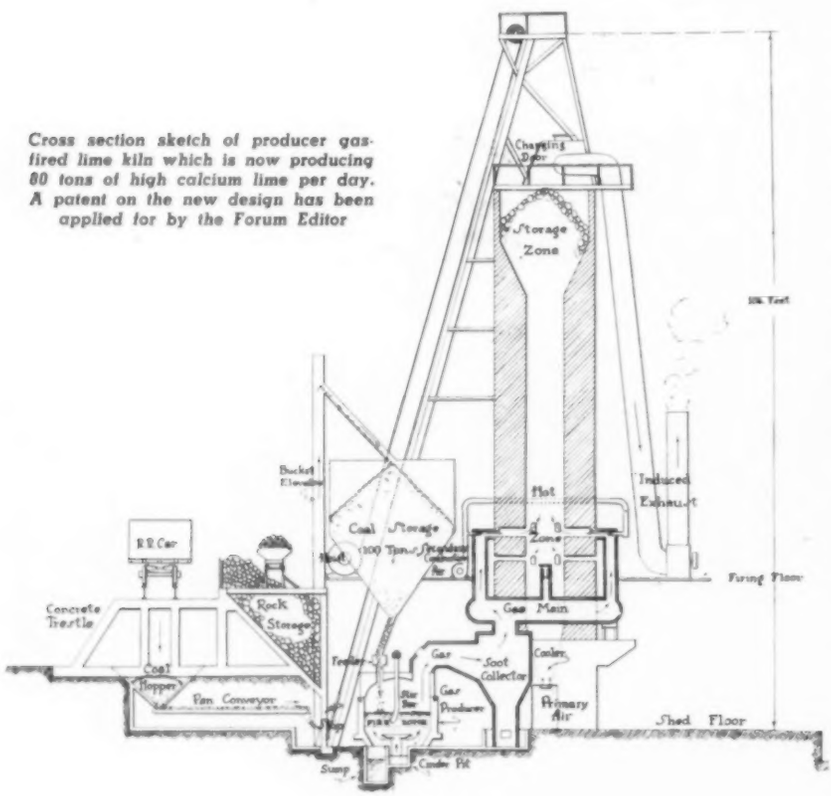
FROM A LIME MANUFACTURING standpoint, progress in 1937 was notable. While the writer is only familiar with a portion of the new developments, he is in position to point out the very exceptional trend towards a higher degree of manufacturing efficiency.

Most encouraging was the renewed interest of the National Lime Association in lime production as evidenced through the staging of special sessions at the annual meeting devoted entirely to operating matters. As the subject of lime manufacture is so very specialized, the operating superintendent can get little of value except at the meetings specially devoted to his problems, and it is expected that operating problems will be given increased prominence and additional time at the coming meetings. In view of this, it is hoped that in the future the presidents of the lime companies will bring along not only sales managers, but also the superintendents. We are certain that if this is done, the company will be more than fully repaid.

Rotary Kilns

In the field of the rotary kiln, some doubt was expressed in one of the more recent articles in the Lime Forum about the performance. While some of the exceptionally long rotaries recently placed in service do not as yet perform with complete satisfaction, others seem to be operating very close to expectations. Doubt was voiced mainly with reference to fuel ratio and stack temperature. We are now happy to report that one long kiln, fired with eastern coal, was hastily tested by the Forum Editor, and it was found that the fuel ratio was 4½ to 1 and that terminal temperature was 750 deg. F. which is very good indeed.

While it is true that these results were obtained at a fairly low kiln capacity and that at a higher capacity they may not have been so good, at the same time it was noticed that there were several possible further improvements. We are now inclined to believe that in the next year or two, more will be done and more will be heard about the performance of long rotary kilns and their increasing capacity while maintaining high efficiency. After all, both the rotary and the vertical kiln are still in the process of development, and increasingly better results may be expected from the two types.



Cross section sketch of producer gas-fired lime kiln which is now producing 80 tons of high calcium lime per day. A patent on the new design has been applied for by the Forum Editor

Eighty Ton Capacity Vertical Kilns

It has been mentioned on several occasions that a vertical kiln of proper proportions, efficiently operated, should produce one ton of lime per square foot of shaft area rather than the all too frequent quarter ton rate. The problem, however, has always been to get the center of the shaft to work in unison with the sections adjacent to the burners. This difficulty has now been solved, and one natural gas fired kiln has been operating at this rate for several years. It has been questioned whether it can also be done with producer gas, but this uncertainty has been answered in the affirmative by experience with two kilns. As these kilns are very large, they now produce at the remarkable rate of 80 tons of high calcium lime per kiln per day, and as the shaft is only 76 sq. ft. the ton per square foot rate is actually exceeded.

There is nothing impractical about operating at this rate; kiln life is actually longer, the trimming of kilns simpler, the lime better and the fuel ratio higher. Considering both the increase in daily capacity with the lengthening of kiln life, it appears that at a very small expenditure the plant capacity has been raised 50 percent.

With the problem of capacity solved, it is now possible to build complete modern kilns quite cheaply. At present there is being built in a lime plant in Arizona, complete new kilns with foundations, exhaust fan and even some elaborate instruments which will cost only about $150 per ton of capacity. However, in this case natural gas is the

fuel, and with this fuel much more can be accomplished at less cost than when the more costly and complicated producer gas installation is built.

When natural gas is not available, the producer gas installation is inevitably selected. Recently a direct-fired dolomite plant in the East was converted to gas. A modern producer unit was installed, the old kilns were rearranged and adapted to gas, and the result was virtually a new modern plant. Results in all respects were improved, and in addition the perpetual cloud of smoke, so irritating to the wealthy residents in the vicinity, was cleared from the sky.

Burning of Spalls in Vertical Kilns

Probably the most notable achievement of the year and one that is destined to have far-reaching results is the successful burning, in a cheap vertical kiln, of quarry spalls which were formerly wasted. The burning of spalls was discussed in the Forum on frequent occasions, but the discussion had to be theoretical in nature. It was contended, however, that properly sized spalls certainly can be burned. This theory has not only been demonstrated satisfactorily, but the spalls burned are not sized but were taken at random from the quarry.

Fig. 1 shows the hand loaded rock from the quarry as charged to lump lime kilns, and Fig. 2, which was taken at the same distance to show the true size contrast, are the spalls. After the large stone is loaded, these spalls are forked up from the quarry floor and then, without any further preparation, sent to the kiln stone bins. In this plant 40 tons of such spalls are utilized daily, an amount which through the many years of this plant's existence was previously sent to the dump. One is tempted to figure the money lost, but for peace of mind it is far better to figure the money to be saved. Fig. 4 shows two cars of rock; to the left is the spalls and to the right is the large limestone rock.

Fig. 4: Two quarry cars of rock ready to be moved to the lime kilns. To the left is a car of spalls and to the right is a car of hand loaded rock ready for the lump lime kiln

Fig. 3 shows lime from the spall kiln. Although results with this kiln are good, they would be better if the size of the stone would be confined to some reasonable range. However, it is just as well that the experiment was tried under actual conditions rather than under an ideal sizing of spalls as it proved the practicability of the method.

What this will lead to, we do not know, but in the plant in question the superintendent already has ordered harder shooting to reduce hand breaking and also after-shooting since an increase of spalls does not concern him. Steam-shovel operations in the quarry and crushing of rock now will be permissible even in plants that cannot otherwise dispose of the small stone. Utilization of some of the tremendous spall piles that some companies now have is also something to consider for the future.

It is exceedingly interesting to see the development in the lime industry reveal increasing progress. In ten years, certainly in twenty, we will really have made notable advances that will legitimately belong to the twentieth century industrial era.

Labor Contract

Southern States Lime Corp., Crab Orchard, Tenn., is reported to have signed a contract recently with an A. F. of L. local which provides for a 48 hour week, time-and-a-half for overtime, double-time for Sundays, and holidays, and a substantial hourly wage increase. Another provision establishes an arbitration board above a grievance committee of the union, to adjust all controversies and avoid strikes. Full seniority rights were granted and the local union is recognized as the sole bargaining agency for the employes. The union claimed a membership of 86 out of a total of 90 employes.

Fig. 1, left: Hand loaded rock from the quarry as charged to lump lime kilns. Fig. 2, center: Spalls, which were formerly wasted, are now burned in a special kiln. Fig. 3, right: Lime from the spall kiln. Hat indicates relative size.

HINTS AND HELPS FOR SUPERINTENDENTS

Car Spotting Equipment Saves Labor

By C. O. GRANGER
Supt., Chas. H. Young Co.,
St. Paul, Minn.

SPOTTING RAILROAD FREIGHT CARS is made comparatively easy with the equipment illustrated in the sketch. It operates as follows:

With a stop button at the post, a few feet from monkey drum, and enough slack in the haul line so a hitch may be made on an empty car, cut off four or five empty cars. Then, by releasing clutch throw-out lever which engages puller drum clutch, cars may be moved down by pulling the operating hand line and are stopped in a position where a hitch may be made next time. Now cut off the car to be loaded and the operator may spot the car and load from the loading platform as the operating line is within his reach at all times. By pulling the operating line one way, friction is placed on the puller, and by pulling it in the opposite direction, it will stop car at any point. When the car is loaded and ready to run down the track, the operator, from a position near the clutch throw-out, can move the car until it starts down grade and then disconnect car hitch. This hitch is a latch device which can be removed when it is in tension. By using the throw-out lever and throw-out puller drum clutch, the cables will move back by the pull from the trolley until the button stops at the post, either by hitting post or by the operator using the brake. The hitch may now engage the next car and the operation repeated.

The hoist was made from an old steam hoist, using the rear drum and bed. The brakeband was taken off, and an automatic shoe or small brake, operated by a light U bar which rides cable, was used. A pull on the cable raises the bar which releases the shoe, and when the cable is slacked off the drum may reverse or run back, the bar dropping down and setting the shoe.

When pulled, the lever on the friction drive, to which the hand line is attached, moves the outer bearing forcing the friction drive, and when the hand line is released, the lever and bearing are forced back by springs or weights.

PRIZE CONTEST ANNOUNCEMENT

THREE of the articles submitted in *Rock Products'* annual contest for novel ideas in operating and maintenance practices and equipment are published in this issue. The others will appear in the February issue, at which time the winners will be announced. Limitation of time in which to judge the relative merits of the articles submitted prevented this announcement from appearing in this January issue.

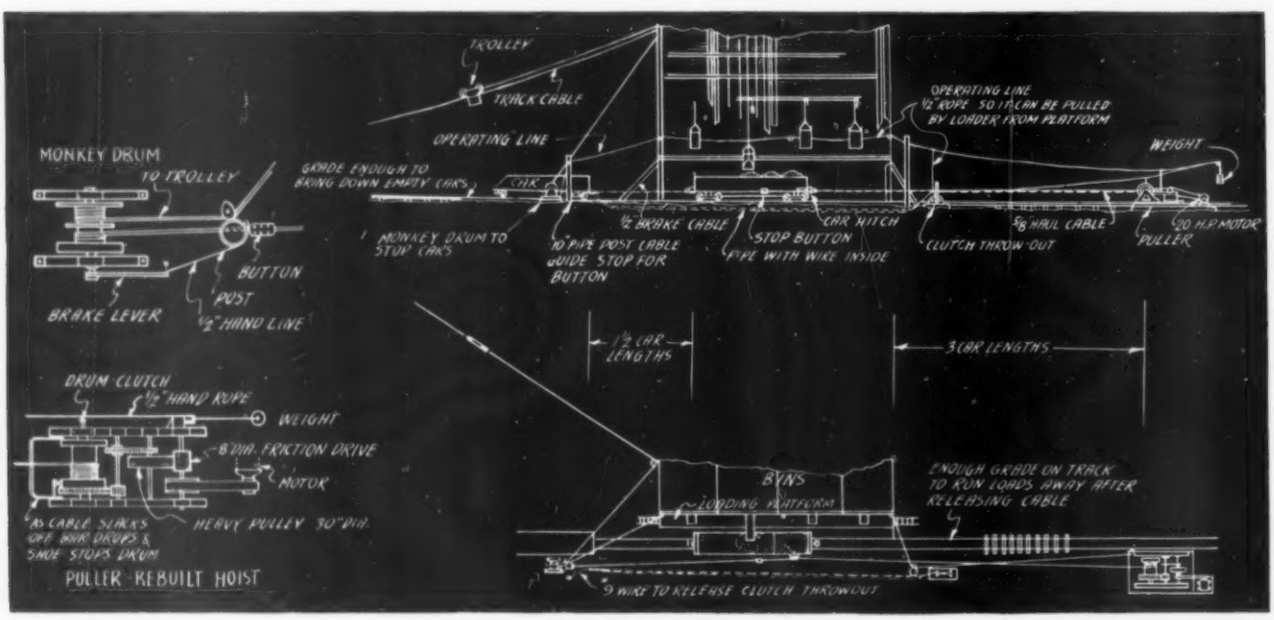
Rock Products* is always pleased to have articles of this kind sent in for publication throughout the year, and they will be paid for at our regular space rates.—*Editor

Solving a Sand Dewatering Problem

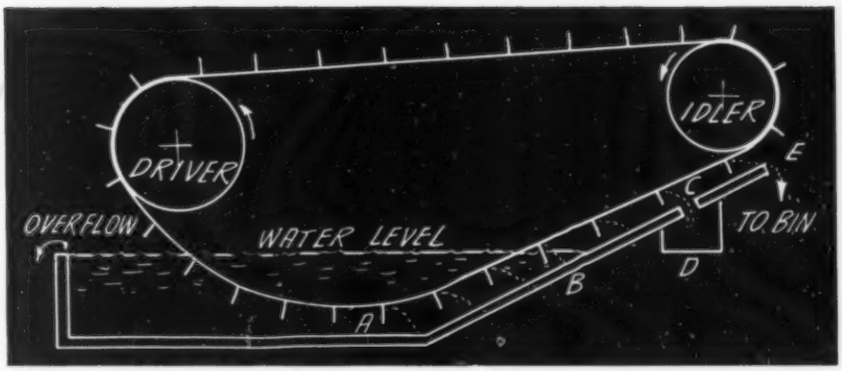
By JOHN S. DUNNING
The Atlas Sand, Gravel and Stone Co.,
Hartford, Conn.

MUCH OF THE SAND from our washing plant is taken by trucks directly from the bins for delivery. The problem of de-watering the product is therefore important.

To obtain drier sand, the settling tanks were replaced by home-made "paddle tanks", shown in the illustration, in which the settled sand (A) is dragged up an incline (B), allowing the free water to drain out before being discharged into the bin. However, each paddle in dragging up the sand



Sketch showing how railroad freight car spotter is operated with one man. The illustration also shows assembly details of the home-made monkey drum, puller, and clutch throw-out



Paddles drag sand up incline (B) to point (C), which is a gap, 1½ in. to 2 in. wide, in the boards. As the sand is dragged over the gap, the small pool of free water and a little of the sand drops through to a chute and is sluiced back into the tank

carries a little free water into the bin —and a little is too much.

This excess water was finally eliminated as shown in the illustration. By separating two of the boards near the top of the incline, a gap (C), about 1½-in. to 2-in. wide, is formed. As each paddle of sand is dragged over this gap the small pool of free water and a little of the sand drop through the gap into a chute (D), from which it is sluiced back into the "paddle tank" or to an outdoor storage pile. The comparatively dry sand continues to the top of the incline and is discharged into the bin (E).

A Home-Made Drifter

By IVOR RAMM
Southard, Okla.

Our home-made drifter was not beautiful to behold, but it was our own little brain child and accomplished its mission.

As operators of a small Southwestern gypsum quarry, we were faced by the necessity of driving a haulage tunnel through both gypsum and anhydrite. For underground drilling of gypsum, we were equipped with electric drills and for surface drilling of gypsum or anhydrite we had hand-held pneumatic drills, but for efficient tunnel work in hard anhydrite we possessed nothing suitable.

It was concluded that a drifter drill would be necessary for the tunnel rounds in anhydrite, yet the amount of anhydrite to be drilled would not justify purchase of a "boughten" shell mounting and jack-bar outfit. We therefore decided to attempt making our own equipment.

Fortunately, we had available an Ingersoll-Rand L-74 hand-held drill, together with both wet and dry drifter heads, which had been used on the drill in a light derrick mounting for quarry work.

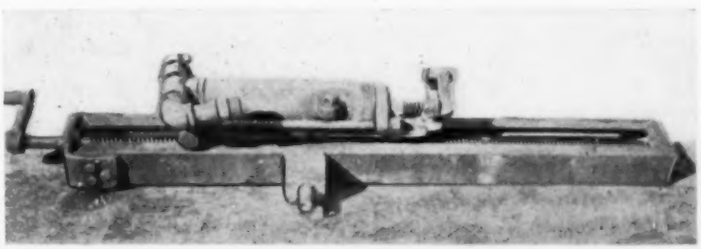
With the drill overhauled, we set to work on the mounting. A three-sided rectangular box structure of 3- x 1½- x ⅜-in. channel was welded, using steel channel sections. The fourth side of the box, at one end, was a U-shaped steel plate which was bolted in place so that the drill can be slid out of the snug-fitting frame. As runners for the drill, we welded two 1¼- x 1¼- x ¼-in. angles inside the channels.

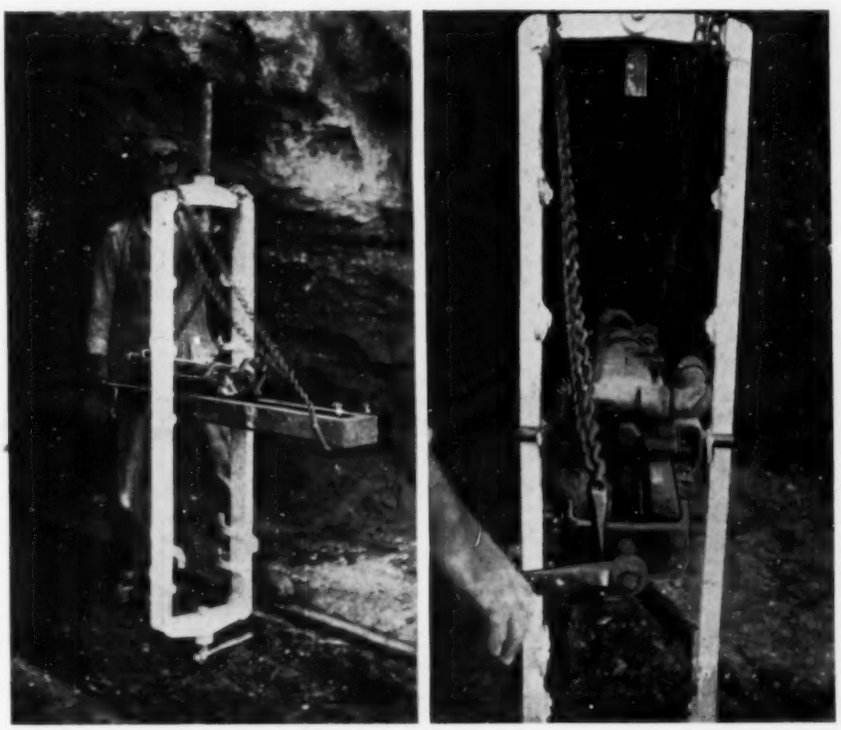
The junk pile yielded an old thread bar from a discarded lathe and a bronze nut to fit it. These were cleaned, oiled, and cut and turned to the proper size. The nut was tack-welded to the drill. Finally, two lugs with bracing were welded to the box structure to allow suspension of the mounting in a standard electric drill frame. The completed job is shown in the illustration. Chains with quick-snapping hooks were used for holding the drill at the required angle.

The home-made drifter worked excellently during the tunnel job. The only difficulty encountered was that the threads on the feed bar did not have the proper pitch, so that while the drill fed very easily into the hole, it was comparatively slow in cranking back for a change of steel. As the mounting was designed for a 30-in. feed, a two-foot drill change was handled readily.

In the three illustrations are shown views of the assembled drifter; one out of the drill frame and two in position mounted in a standard drill frame.

Close-up of Drifter





LEFT: Special drifter used in a gypsum quarry to drive a haulage tunnel through both gypsum and anhydrite. RIGHT: Drifter is mounted in a standard electric drill frame

Industry Shows Remarkable Growth

IMPROVE ROCK WOOL MANUFACTURE

By BROR NORDBERG

PROBABLY, the most rapidly growing rock products industry during the past few years, and particularly in 1937, has been the manufacture of mineral wool—from the standpoint of increase in the number of plants, the tonnage produced, and the development of operating technique.

Surveys of the industry, however, reveal a marked lack of standardization. Certainly a great many varieties and qualities of rock wool are now on the market. The cupola is the standard method of manufacture, but it is doubtful if any two companies are consistent in their regulation of the wool making process. Differences in the types of raw materials, their chemical composition and melting points; proportion of the batch; the quality and purity of fuels; the melting temperatures; temperatures of the molten mass when "blown"; air and steam pressures; and structural design of the cupola, all have their influence on the quality of the final product.

In spite of this lack of standardization, builders have created a demand for an efficient insulating material, and experimentation by manufacturers and others interested has resulted in a finer product.

Production Statistics Encouraging

Production of mineral wool in 1928 for the United States was 50,000 tons. In 1937, the estimated capacity was 500,000 tons. The number of plants has increased from eight in 1929 to 60 in 1937; truly a remarkable growth. A number of established stone producers are manufacturing rock wool as a by-product.

Federal Rock Wool Plant of Kansas City

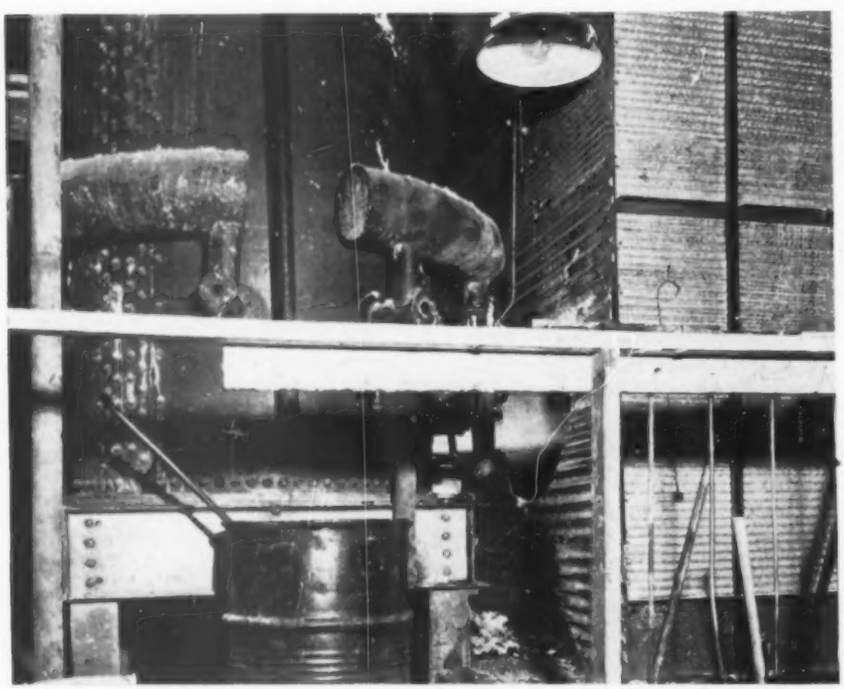
Typical practices can best be treated by discussing operating methods of a new modern plant. The plant which we have chosen is that operated by the Federal Rock Wool Co., Kansas City, Mo. This plant is owned by a producer of commercial crushed stone and its original design incorporates several interesting features.

Materials from which mineral wool is made are very numerous and include calcareous shales, metallurgical slags, sand, soda ash and limestone and waste glass, combination of dolomites and limestone with shale or clay, old china or crockery, firebrick and sometimes top soil.

At the plant under consideration, various rocks are blended and melted to make a lightweight, white wool of low thermal conductivity, and the process has been largely developed by the "trial and error" method.

The plant is within a short hauling distance from the commercial stone mines. Stone from these mines, with a calcium carbonate content of about 90 percent, makes up about 50 percent of the materials charged into the cupola.

Louis Marino, president of the company, developed the process and designed the plant. Several of the original features of the plant are unprotected by patents and the methods by which the process was developed were not the outcome of chemical analyses but by experimentation. It is therefore inadvisable and impractical to go into all details of the manufacture of wool at this plant.



Blowing the molten rock by steam into the collecting chamber at the new plant of Federal Rock Wool Co. The cupola is water-jacketed to its full height and steam is generated to pressures exceeding 100 p.s.i within the water jacket. When the fire is started in the cupola, three hours are needed to reach the desired pressures. Steam is blown through a single stream of molten rock in front of the chamber opening

Blend 23 Varieties of Stone for Feed

Mr. Marino, the president of the Federal Rock Wool Co., has been interested in the production of stone in Jackson county for over 20 years, and has utilized his knowledge of rocks in the surrounding country to advantage in formulating a proper blend for rock wool. According to Mr. Marino, some 500 different rocks, including limestone, flints and others of igneous origin, are available in Jackson county and his selection for the feed into the cupola has been determined by actual experimentation and without knowledge as to which are basic and which are acidic.

The most successful batch of raw materials consists of 23 varieties of rock, including the Bethany stone, all of which are trucked to the plant from within a radius of 25 miles. The hair trigger control used in blending various stones has proven to be of the utmost importance. This close control results in the production of a wide variety of rock wools with considerable differences in physical properties, just by slight changes in the constituents. While about 50 percent of the feed comes from the commercial stone mines, on the other

hand, as little as six tons of another variety is used in three weeks of operation, to make the best wool for domestic use.

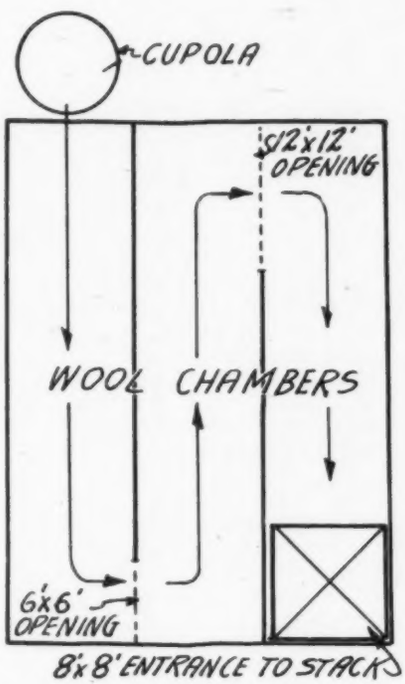
All stone is trucked to the plant bins. Truckers are hired by Mr. Marino to "pick up" the different rocks from charted locations. Stone feed is proportioned according to exact weights. The plant itself is a new 42- x 115-ft. stone veneer building, designed for installation of a second cupola at a future date.

Although the manufacturing process, the method of collecting the wool and its handling, in the main, are similar to those used in other plants firing cupolas, the equipment has structural features that are somewhat different. The cupola is essentially an old steam boiler, without the flues, with a 6-ft. outside diameter, and is 14 ft. in height. It is water-jacketed to its full height with a 3- to 6-in. space between the outer wall and the jacket shell.

Generate Steam in Water Jacket

Steam for blowing the molten rock into the collecting chamber is generated within the water jacket, simultaneously with the melting of the rock and not from an outside source. When the fire is started in the cupola and coke is added, about three hours is required to develop the desired steam pressures to "blow" the wool. Steam pressures are varied between 100 and 125 p.s.i. Two reserve steam pressure tanks of 1200 gal. and 400 gal. capacities are provided. Alternate beds of coke and stone are fed into the cupola in the conventional manner and the molten rock flows into the path of the steam jet from a single opening. The quality of the finished product is influenced, and its physical characteristics varied, by changes in the coke-stone ratio.

Bats of rock wool are measured by marking knives and cut to size as the wool is carried over the conveyor from the collecting chamber. Loose wool recovered in auxiliary chambers is collected and removed by entering the chambers through the doorways seen on the right. The men in the foreground are boxing the wool product. To the left of the conveyor are J. G. Hoover, vice-president, Louis Marino, president, and E. J. Flinn, secretary-treasurer of Federal Rock Wool Co., from left to right



Baffle arrangement in the collecting chamber, which successfully recovers much of the fine product that would otherwise pass out the stack with the exhaust steam

Rock wool is blown into a collecting chamber 48 ft. in length, 12 ft. high and 6 ft. wide. The illustration shows the rolls which are not anchored to a fixed position, but are allowed to slide up and down through a 12-in. channel bar. The bats are cut by hand into 15- x 23-in. sizes to the desired wall thicknesses, and boxed in cardboard boxes direct from the cutting table. The conventional box contains 24-sq. ft. of rock wool in bats.

Baffle Arrangement To Recover Fine Wool

In the accompanying sketch is shown how approximately a ton per day of fine wool, which ordinarily would be carried away with the exhaust steam out through the stack, is recovered. The mixture of steam, or air, and wool must pass through a circuitous route on its way to the stack, and the "baffle" arrangement arrests the speed of fine particles to the point where practically all the wool in suspension is dropped into two chambers and recovered. At the point where the air exhausts to the outside, the chimney has a horizontal baffle to force much of the very fine material not already settled out in the first two chambers to fall into the third chamber.

Thus far, the only test made on the insulating qualities of the rock wool was made before it was perfected to the present degree. This test, made by the Kansas City Testing Laboratory, gave a thermal conductivity of 0.26 B.t.u. per hour per sq. ft. and with a temperature gradient of 1 deg. F., per inch of thickness. A 3⅝- x 15- x 23-in. bat picked at random from the commercial wool stored in cardboard containers weighed 3¼ lb. or 4.48 lb. per cu. ft. The methods of operation may, of course, be changed to give a wool varying widely in quality and weight.

In addition to bats, loose wool and granulated wool are produced. Trim scraps are thrown into a home-made shredder and the shredded wool is carried over a bucket elevator, 37-ft. centers, and chuted through a 25-ft. circular screen to a 6-ton bin. Shot is removed through the ¼-in. screen openings. The shredded product is packed directly out of the bin chutes into 35-lb. paper bags. Plant capacity per 24 hr. is 300 boxes or 7200 sq. ft. of bats, 3⅝-in. thick, a ton of granulated wool, and a ton of loose wool. Officers of the company, besides Mr. Marino, are J. G. Hoover, vice-president and E. J. Flinn, secretary-treasurer.

NATIONAL ASSOCIATION *Activities*

Sand and Gravel

NATIONAL SAND AND GRAVEL ASSOCIATION in co-operation with the National Crushed Stone Association and the National Slag Association entered a joint and general protest on December 10 against the imposition of 5 and 10c advances in freight rates on interstate shipments; however, the protest proved in vain, for the Interstate Commerce Commission ordered the increases into effect December 20.

The matter is not ended here for several producers, however, because, as Executive Secretary V. P. Ahearn said in his letter to members, just prior to the decision: "The Association is already advised of suspension by several State commissions of proposed intrastate tariffs increasing rates on our materials in the same manner proposed by the tariffs filed with the Interstate Commerce Commission. If the interstate rates become effective on December 20, while intrastate increases are either denied or suspended pending investigation, a number of shippers with interstate movements will be at immediate disadvantage. In such instances, negotiations should be undertaken at once with the interested carriers in order that relief may be had until the intrastate rate situation is finally determined."

Producers should not confuse this decision with that asked for by the railways in Ex Parte 123, which is a blanket increase of 15 percent on all rates. This will come before the I. C. C. early in 1938. Regarding this case Secretary Ahearn says: "The Association will, of course, appear in this proceeding and testify at Washington in opposition to the proposal of the carriers, with the probability that our case will be submitted jointly with that of the National Crushed Stone Association and the National Slag Association. We suggest that in addition to the case which we shall submit, individual producers or groups in the various parts of the United States should appear at the regional hearings, supporting by description of local conditions the national point of view presented by the Association in the main hearings at Washington. We should like to know of participation by member companies in regional hearings, and we invite their attention to rules of procedure appearing in the announcement of the Commission."

1938 Conventions

AMERICAN Road Congress, Machinery Show and convention of American Road Builders' Association, Cleveland, Ohio, January 17-22.

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NATIONAL Crushed Stone Association, annual convention and machinery exhibit at Cincinnati, Ohio, January 24-26, incl., Netherland Plaza Hotel.

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NATIONAL Sand and Gravel Association, annual convention and machinery exhibit at Cincinnati, Ohio, February 1-3, incl., Netherland Plaza Hotel.

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NATIONAL Ready Mixed Concrete Association, annual convention and machinery exhibit, February 1-3, incl., Netherland Plaza Hotel.

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NATIONAL Concrete Masonry Association, National Cinder Concrete Products Association annual conventions, February 8-11, incl., Hotel Sherman, Chicago, Ill., in conjunction with the American Concrete Contractors' Association. The Cast Stone Institute, Medinah Club, Chicago, February 7-8. The Concrete Industries Exposition at the Hotel Sherman, February 8-11.

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AMERICAN Concrete Pipe Association annual convention at the Plaza Hotel, San Antonio, Texas, February 15-16.

Convention Program

Some of the engineering and operating features to be considered at the coming convention of the Association at Cincinnati are given by Stanton Walker, director of engineering as follows:

(1) A discussion of the effect of deleterious substances in aggregates. What are they? How may they be identified? How may their effects be evaluated? R. R. Litehiser, chief engineer, Bureau of Tests, Ohio State Highway Department, will handle this subject.

(2) What are the opportunities for the use of sand and gravel in bituminous mixtures? In what types of mixtures are they particularly applicable? What specifications will serve best to bring about the increased use of sand and gravel in bituminous construction? Bernard E. Gray, chief highway engineer, Asphalt Institute, has consented to prepare a paper along these lines.

(3) Experiences in the use of gravel as railroad ballast. Final arrangements for a speaker on this subject have not been made but negotiations are in progress.

(4) Problems in the production of sand and gravel for a large project. One member company of the Association who has had a recent and most interesting experience in that regard has been requested to present a paper on it.

(5) A round table on specification problems. Arrangements are being made with representative members in different localities to discuss their problems in that regard in the belief that an interchange of such information will be helpful to all members of the Association.

(6) Design and control of concrete mixtures with particular reference to aggregates. This represents a subject for which the many different theories need to be correlated and clarified. Miles N. Clair, vice-president of the prominent firm of engineering consultants, Thompson and Lichtner, will prepare a paper on this subject.

(7) Where do we stand with respect to our knowledge of concrete? What have we learned that is useful and what are those phases of the subject on which information is most needed? A tentative acceptance to present this matter has been received from an outstanding research engineer.

(8) What are the functions of industrial research and what are problems of the sand and gravel industry on which research is most needed? As to the first phase of that subject it will be discussed by C. L. Warwick, secretary-treasurer of the American Society for Testing Materials. Mr. Warwick, in his capacity as principal administrative officer of that important standardizing body, occupies an unequalled position to observe the tangible results of industrial research. Research problems

of the sand and gravel industry will be discussed by Alex. W. Dann, chairman of the Research Committee of the National Sand and Gravel Association, and Stanton Walker.

Crushed Stone

NATIONAL CRUSHED STONE ASSOCIATION, through Administrative Director J. R. Boyd, announces that one of the features of the coming January convention at Cincinnati will be a "Labor Relations Clinic," for free and frank discussion.

Two new active members joined in November: Blue Rock, Inc., Washington Court House, Ohio; Erie Stone Co., Indianapolis, Ind. Four new associate members are Blaw-Knox Co., Blawnox, Penn.; Koppel Division, Pressed Steel Car Co., Pittsburgh, Penn.; Caterpillar Tractor Co., Peoria, Ill.; Ross Screen and Feeder Co., New York City.

Industrial Sand

NATIONAL INDUSTRIAL SAND ASSOCIATION members have been informed by Executive Secretary Ahearn that "the Interstate Commerce Commission has suspended the proposed tariffs increasing rates on industrial sand on the basis of 30c per ton, filed by the carriers to become effective Dec. 20, 1937. The Commission, however, held that this suspension was without prejudice to the right of the carriers to file new tariffs making an increase of 20c per ton on industrial sand, to be effective on one day's notice.

"Our information is that the carriers intend to confer with one another as to publication of the 20c per ton increase. This will entail a delay of certainly some days and perhaps several weeks before the 20c increase will be filed with the Interstate Commerce Commission."

Ready-Mixed Concrete

NATIONAL READY MIXED CONCRETE ASSOCIATION has announced some of the technical features of its annual convention at Cincinnati, Ohio, the week of January 31. Stanton Walker, engineering director, says some of the subjects to be discussed are:

(1) Reports of the Technical Problems Committee and the Committee on Standards. The latter will deal particularly with standards for truck mixers.

(2) A paper discussing the status of our knowledge of concrete—what useful facts have been developed by research, and what are the phases of this most important construction material on which information is most needed.

(3) The design and control of concrete mixtures will be covered in an authoritative paper. There is much need to correlate and clarify some of the conflicting theories as to the best methods for designing concrete. Particular attention will be paid to the effect of aggregates.

(4) Lime-putty has aroused much interest in the industry and a number of producers have fitted that business in with their ready mixed concrete business. A paper on the subject will be presented by Norman Hough, former president of the National Lime Association.

(5) Developing markets for ready mixed concrete, merchandising and servicing problems and the like will occupy prominent places on the program.

Lime Putty

LIME PUTTY PRODUCTS ASSOCIATION, of which Hayden Brooks, Birmingham, Ala., is secretary, will hold its second annual meeting at the Netherland Plaza hotel on February 1, at the same time as the National Sand and Gravel and the National Ready Mixed Concrete Associations are holding their conventions. The meeting will be held Tuesday evening, starting at 7 o'clock with a dinner. The program includes addresses by Lee Trainor, chief of the construction department, National Lime Association, on "The Proper Use of Lime Putty in Brick Mortar"; by John C. Best, president, Best Bros. Keene's Cement Co., on "Lime Plaster"; by Milo E. Smith, advertising manager, Chicago Bridge & Iron Co., on "Keep Selling—Don't Coast."

In addition to the above program, Norman Hough, former president of the National Lime Association and recently with the Richter Concrete Corp., Cincinnati, will present a paper at the afternoon session of the National Ready Mixed Concrete Association, February 1, outlining how lime putty plants fit into the operation of the ready-mixed concrete plants in the production of ready mixed mortar and plaster.

Sand-Lime Brick

THE SAND-LIME BRICK ASSOCIATION, J. Morley Zander, secretary-treasurer, announces that its annual convention will be held at the Statler Hotel, Cleveland, Ohio, February 14, 15 and 16, 1938. Mr. Zander's address is P O. Box 216, Saginaw, Mich. All sand-lime brick and block manufacturers are invited, whether present members of the association or not.

Lime

NATIONAL LIME ASSOCIATION construction engineer, Lee Trainor, presented a paper on "Some Aspects of the Use of Hydrated Lime in Portland Cement Concrete" at the annual meeting of the New York and New England Highway Testing Engineers in Boston, Mass., November 17. Other meetings with architects, engineers and builders were held at Miami, Fla., December 6; Birmingham, Ala.; December 8; Atlanta, Ga., December 9; Charlotte, N. C., December 10.

Dust Control

DUST CONTROL EQUIPMENT ASSOCIATION, Cleveland, Ohio, announces that at a recent meeting the following officers were elected for the ensuing period: Chairman, John Hellstrom, vice-president, American Air Filter Co., Louisville, Ky.; Vice-Chairman, S. S. Parsons, Parsons Engineering Corp., Cleveland. Arthur J. Tuscany continues as executive secretary and treasurer.

Announcement is also made of further progress in the organization's program which has been under way for some time, looking toward developing standards of dust control practice that will be of material help to the purchaser as well as the manufacturer of dust control equipment. In its work in this direction the association is co-operating with the Hygiene Codes Committee of the American Foundrymen's Association, Committee Z-9 of the American Standards Association—dealing with fundamentals relating to the design and operation of exhaust systems, and also any work which the Air Hygiene Foundation may do in this connection.

At an earlier meeting, Theodore Hatch, New York State Department of Labor, discussed certain phases of dust control practice before the group, and invitation has been extended to the chairman of the A. F. A. Hygienic Codes Committee to meet with the engineering committee and the association at the next meeting.

The membership of the Association is comprised of the following companies: American Air Filter Co., Louisville, Ky.; American Foundry Equipment Co., Mishawaka, Ind.; Parsons Engineering Corp., Cleveland, Ohio; W. W. Sly Manufacturing Co., Cleveland Ohio; C. B. Schneible Co., Chicago, Ill.; Whiting Corp., Harvey, Ill.

Test Price Fixing

CARTER COAL CO., whose previous suit resulted in the Supreme Court invalidation of the original Guffey Coal Act, has filed formal protest with the National Bituminous Coal Commission against price scales established recently under the new Guffey Coal Price Fixing Act. It is assumed that this case will be carried through to the Supreme Court and may result in invalidation of the new act.

Federal Trade Commission Weighs Fate of Cement Industry

THE FIRST WEEK in December the Federal Trade Commission in Washington, D. C., "heard" the Cement Institute's case pro and con. Various witnesses from government departments attempted to establish that selling cement on the basing point price system was monopolistic price-fixing. They did show uniformity of bid prices, which is not new and not peculiar to the portland cement industry.

Walter B. Wooden, the commission counsel, tried to inject a popular appeal into his accusation by stating at the onset: "It is not too much to say that success of pending governmental efforts to revive industry and increase employment through the housing program for instance, rests upon the theory that underlies this complaint, for it is obvious that with prices and production under monopolistic restraint, increased demand, however contrived, can only fortify the forces of monopoly."

Replying, George S. Leisure, attorney for the Institute, said:

"It is the theory of the Government, as I read the complaint, that true price or actual price is mill price, while on the other hand, it is our theory and it will be our contention throughout this case, that sales price means where the sale is made, what the purchaser pays for it, and I may say that our theory is entirely substantiated by the National Sales Act as to where price is fixed.

"But, however, it may finally be determined by Your Honor as to these two economic theories. One thing I am entirely clear on, and that is that the law governing these two theories is well established, and that whether you call what a person pays for his goods, prices, or whether you call it wampum, or whatever you call it, there can be no discrimination of price so long as all purchasers are treated the same, and that we expect to demonstrate entirely to Your Honor's satisfaction that this industry has done the same with private purchasers as with the United States."

The Cement Institute, through its president, W. B. Storey, made a public statement which included this paragraph: "Fundamental economic problems are involved in this case, and for this reason the cement industry and the Cement Institute are contesting the complaint. Since the issue has been drawn they hope that the Federal Trade Commission will proceed with a thorough study, not only of the marketing methods which exist in the cement industry, but also of the possible effects of imposing untried theories on industry."

A ghost of NRA days arose to embarrass the Cement Institute, for the files of the Code Authority of the industry has evidently yielded up a letter which has been published in part in an article by John T. Flynn in the New York *World Telegram*: "The President told the head of the Code Authority under NRA to inquire of the cement industry why it refused to abandon the basing-point system on its orders to the United States Government.

"At that time, the government was almost the only buyer. It wanted to get a price based on the cost at the mill —f. o. b. mill price. Then the freight could be added. If there was no freight or little freight, the government would not have to pay freight. The Cement Institute turned this down. It made its usual claim that this was in the interest of preserving competition and preventing monopoly.

"A leading cement manufacturer—head of a large company and an officer of the Cement Institute—hearing of this, wrote a letter to the head of the Code Authority. He said he regretted the action of the Institute in not cooperating with the government.

"He also said that he favored the granting of the President's request, but that on the larger question, the maintenance of the basing-point system, he felt he had to stand by that. However, he insisted, he had to be honest as to his reasons:—

" 'Do you think,' reads his letter, 'any of the arguments for the basing-point system which we have thus far advanced will arouse anything but derision in and out of the government? I have read them all recently. Some of them are clever and ingenious. They amount to this, however; that we price this way in order to discourage monopolistic practices and to preserve free competition.

" 'This is sheer bunk and hypocrisy. The truth is, of course, and there can be no serious, intelligent discussion of our case unless this is acknowledged—that our industry is one which above all others cannot stand free competition, that it must systematically restrain competition or be ruined.' "

Increase Facilities for Asbestos-Cement Products

PARTICULARLY IMPRESSIVE, in reviewing activity in the asbestos industry during 1937, has been the expansion of facilities for manufacturing asbestos-cement products, especially asbestos-cement pipes, according to the magazine *Asbestos*.

Among the new plants completed and under construction are the two plants of Keasbey and Mattison Co., at St. Louis and Ambler for the manufacture of pipe, and the million dollar plant built by Johns-Manville Co. at Watson, Calif., where rock wool and asbestos-cement pipe are to be made.

The Ruberoid Co. is making a varied line of asbestos-cement products at its new extension in St. Louis, Mo.; Turner and Newall, Ltd., built a plant in Scotland; Asbestos Cement, Ltd., has started a new factory at Athey, Ireland; Flintkote Co., Chicago, Ill., has announced a new line of asbestos-cement shingles and siding; Kenilworth Manufacturing Co. has started production in its Kenilworth, N. J., plant; and Celotex Corp. is manufacturing asbestos-cement insulating board at a new plant at Metuchen, N. J.

Expansions in other asbestos lines have also been evident. Included in miscellaneous developments are the asphalt roofing plant of the Lehon Co., at Memphis, Tenn.; the completion of plant additions at the asbestos mine of Vermont Asbestos Corp., Eden, Vt.; an increase in capacity completed by Allbestos Corp., Philadelphia, Penn.; the purchase of a plant at Richmond, Ind., by Johns-Manville for the manufacture of a new low temperature insulation; and the purchase of an asphalt roofing plant at Minneapolis, Minn., by The Ruberoid Co.

Increase Mining Activities

Asbestos mining activities were increased considerably in 1937. Arizona deposits were worked more extensively than for many years; Canada's production greatly exceeded that of 1936; and new deposits have been developed in China and South Africa.

New Products

During the year a number of new products were placed on the market, and almost 100 patents were issued on products containing asbestos. Among these products are a number of types of asbestos-cement shingles, an insulated sheathing roof deck of asbestos-cement composition, a new type industrial siding and an asbestos paper designed for the covering of warm air pipes and air conditioning ducts. Indications point toward an even better year in 1938.

TRENDS—

Evidenced by Machinery Purchases

UNIVERSAL ROAD MACHINERY CO., Rubert M. Gay Division, New York City, reports recent installations of Gayco air separators at Cementon, N. Y., plant of Alpha Portland Cement Co.

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EARL C. BACON, INC., New York City, announces recent installation of 54-in. diameter by 24-in. face Farrel-Bacon crushing rolls at the Kingston Trap Rock Co. plant, Kingston, N. J.

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STRONG-SCOTT MANUFACTURING CO., Minneapolis, Minn., is installing 11 direct-firing coal mills at the Kosmos Portland Cement Co. plant, Kosmosdale, Ky.; six mills are for firing kilns, two for auxiliary boilers, three on rock and clay dryers.

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JACKSON & CHURCH CO., Saginaw, Mich., announces sale of a Type A, Model 14 sand-lime brick press to the Grays Harbor Brick Co., Philadelphia, Penn.

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LIME AND HYDRATE PLANT CO., York, Penn., reports recent installation of Kuntz system of hydrated lime manufacture and dust control at J. E. Baker Co., plant near York, and order for same kind of installation by Salem Lime and Stone Co., Salem, Ind.

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SYNTRON CO., Homer City, Penn., reports sale of six vibratory feeder conveyors to Lehigh Portland Cement Co., Allentown, Penn.

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DEMPSTER BROTHERS, Knoxville, Tenn., reports the sale of nearly 50 "Dempster-Dumpsters," with from 2 to 10 containers each, during the year 1937. Many of these are in quarries, replacing industrial railway haulage.

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ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis., reports contract with Hermitage Portland Cement Co., Nashville, Tenn., for 9½x8x10 ft. clinker grinding preliminator and 400-hp. synchronous motor drive, augmenting present grinding equipment to increase capacity to about 175 bbl. per hour.

R & L CONCRETE MACHINERY CO., Kendallville, Ind., reports the sale of approximately $10,000 worth of Crescent reinforced concrete joist making equipment, since its manufacture was started in February, 1937.

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BRADLEY PULVERIZER CO., Allentown, Penn., reports the sale of several Bradley Hercules mills for preliminary grinding of cement clinker during 1937. Customers include Trinity, Dewey and Medusa companies in the United States and La Cruz Azul Cement Co., Mexico, and the Argentine Portland Cement Co., Argentine, S. A. Century Cement Manufacturing Co., Rosendale, N. Y., installed a Griffin mill, and Connecticut Agstone Co., Danbury, Conn., a Bradley 3-roll mill. Air separators were sold to Pennsylvania-Dixie, Giant and Lone Star Cement companies.

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WESTERN PRECIPITATION CO., Los Angeles, Calif., reports some of its larger installations of Cottrell electrical dust precipitators during 1937. Marquette, at Cape Giradeau, Mo.; Alpha, at St. Louis, Mo.; Calaveras, San Andreas, Calif.

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ROBINS CONVEYING BELT CO., New York City, reports recent sales as follows: Portage Gravel Co., Cleveland, Ohio, Mantua plant, double-deck 6 x 12-ft. Gyrex screen for wet sand and gravel; Dolese Brothers Co., Bromide, Okla., double-deck Vibrex screen 4 x 10 ft., limestone; North Cincinnati Sand & Gravel Co., Hamilton, Ohio, double-deck 4 x 6½ ft. Vibrex screen, sand and gravel; Black Rock Co., Charleston, W. Va., 4 x 10-ft. double-deck Vibrex screen for handling hot or cold mix asphalt (one of several similar installations); Crossman Co., South Amboy, N. J., belt feeders, belt conveyors, Gyrex screens, chutes, gates, etc., for sand and gravel; Aluminum Ore Co., Mobile, Ala., three belt conveyors, total length 2065 ft., Weightometer and tripper for handling limestone, coal, ore, etc.

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EAGLE IRON WORKS, Des Moines, Ia., recently sold another Swintek Screen Nozzle Ladder to Bedford-Nugent Co., Evansville, Ind.

SMITH ENGINEERING WORKS, Milwaukee, Wis., reports that it added a 15- x 38-in. Telsmith-Wheeling jaw crusher to its line in 1937 and that a number of these were sold. Preparations were made to build a still larger size—24x36-in. Also, double-roll crushers were manufactured for the first time by this company in 1937. Charles F. Smith, president of the company, says the year 1937 was unusual in two respects: (1) a large export business; (2) few complete plants; most of the business coming from existing plants for rehabilitation and enlargements.

Enterprise

OHIO HYDRAULIC STONE CO., Rockefeller Building, Cleveland, Ohio, is reported to have developed a new kind of building material, which will be exploited for small home construction. The material is said to be made under hydraulic pressure by a process invented by C. C. Hall of Lakewood, Ohio, who is general manager of the company. A special type interlocking wall unit is made so that a 5-in. air space exists between the inner and outer wall surfaces. The character of the material in the blocks is not divulged. A subsidiary corporation, known as the United States Building Unit, Inc., will build a number of houses, using these units.

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CANADIAN GYPSUM CO., Toronto, Ont., subsidiary of the United States Gypsum Co., Chicago, Ill., has purchased industrial acreage and factory buildings at Weston near Toronto, and will recondition the property and install equipment for the production of new building products. The company already operates gypsum plants at Hagersville, Ont., Windsor, N. S., and Hillsboro, N. B., a lime plant at Guelph, and the Toronto Asphalt Roofing Co. plant at Mount Dennis, a suburb of Toronto.

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KERFORD QUARRY CO., Apperson, Kan., is opening a quarry near the Palisades, Garretson, S. D. The rock will be used for rip-rap work on the Missouri River in the vicinity of Sioux City, Ia. A number of years ago there were several active stone quarries near Garretson, but they had not been operated recently.

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ESPY PAVING & CONSTRUCTION CO., Savannah, Ga., has purchased a 10-acre tract of the LaRoche Estate three miles from the city to develop a sand and gravel pit.

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MCCOLLUM LUMBER CO., Tule Lake, Calif., is erecting a plant to make building tile of cement with pumice aggregate.

NEWS ABOUT PEOPLE

P.C.A. Officers and Guest

CHARLES L. HOGAN was chosen chairman of the board of directors of the Portland Cement Association at its recent annual meeting in Chicago. Mr. Hogan is president of the Lone Star Cement Corp., New York City, which enjoys the reputation of being the most prosperous cement company in the United States—chiefly because it has some plants outside the United States!

In the accompanying view Mr. Hogan is congratulating Paul G. Hoffman, president of the Studebaker Corp., for his address on highway safety. Mr. Hoffman said proper highway construction for safety was the most important factor in preventing accidents. On Mr. Hogan's right is Wm. M. Kinney, vice-president and general manager of the P.C.A.; and on Mr. Hoffman's left is Frank T. Sheets, president of Portland Cement Association.

Left to right: W. M. Kinney, vice president and general manager, Portland Cement Association; Chas. L. Hogan, chairman of the board, P.C.A.; Paul G. Hoffman, president, Automotive Safety Foundation; and Frank T. Sheets, president of the Portland Cement Association

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GEOFF. A. SAEGER, whose appointment as chief chemist for the Gulf Portland Cement Co., Houston, Tex., was recently announced by President Kent B. Diehl, is widely known throughout the cement industry. In taking up his new work, Mr. Saeger left a position of great responsibility in the cement section of the United States Bureau of Mines. He has had a broad experience in cement manufacture, having held important posts with a number of the larger plants prior to his connection with the Bureau of Mines at Washington, D. C. He was chief chemist for the Lehigh Portland Cement Co., New Castle, Penn.; chief chemist of the Bessemer Limestone and Cement Co.; superintendent of the Green Bag Cement Co.; and plant superintendent of the Kansas City plant of the Missouri Portland Cement Co. He is now a member of the Portland Cement Committee of the American Society for Testing Materials. The Gulf Portland Cement Co., with which Mr. Saeger is now identified, has the distinction of being the only new cement plant to be erected in the United States during 1937. This plant involved the expenditure of more than half a million dollars, and employs many recent developments in equipment

Geoff. A. Saeger

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KENT B. DIEHL, president and general manager of the Gulf Portland Cement Co., has been connected with the industry for more than 20 years. While in college he started selling cement, and after leaving school he continued his connection with the industry as special engineer, field engineer, salesman, and supervisor of plant construction for some of the largest cement companies in the country.

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JOSHUA L. MINER, technical director of the Atlas Lumnite Cement Co., New York, N. Y., has been elected director and vice-president of that company, succeeding Major C. R. Hulsart, deceased, according to announcement by Blaine S. Smith, president of Lumnite and of the Universal Atlas Cement Co., of which it is a subsidiary.

Mr. Miner joined the Universal Atlas organization in 1922. He has been identified with the Lumnite company from its beginning, starting in 1924 as a salesman and later in charge of sales. In 1929 he went to Europe where he studied use of similar cements. The following year he became technical director of the company.

He was graduated from Lafayette College and entered the employ of the Alpha Portland Cement Co., as chemist. From 1907 to 1910 he was a lecturer on cement and in charge of the cement and concrete laboratories, civil engineering department, Lafayette College. Later he was successively manager, Dallas and New York offices, Pittsburgh Testing Laboratory; Chief of Inspection, Purchase Storage and Traffic Division, General Staff, U. S. Army, 1918, and manager of the Brooklyn Crozite Brick Co. Mr. Miner is a member of the American Society for Testing Materials, the American Concrete institute, and the Highway Research board of the National Research council.

—Blackstone Studios

Joshua L. Miner

ALBERT E. FROSCH, formerly secretary, treasurer and general manager of the Eastern Ohio Sand & Supply Co., East Liverpool, Ohio, has become president and general manager of the Negley Sand Co., which recently opened a plant near Negley to supply the Youngstown, Ohio market. The Eastern Ohio company has left the East Liverpool field in favor of The Milliron Transfer & Storage Co., Inc.

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GEORGE F. COFFIN, JR., has been made general counsel for the Nazareth Cement Co., Easton, Penn. Mr. Coffin is a son of the late Geo. F. Coffin, formerly secretary-treasurer and general manager of the company. Other recent appointments were mentioned in the December issue of ROCK PRODUCTS, p. 79.

●

T. O. EDWARDS, former purchasing agent for the Castalia Portland Cement Co., Pittsburgh, Penn., has been made superintendent of the Diamond Fertilizer Co., Sandusky, Ohio.

●

L. W. SHUGG, division manager, publicity department, General Electric Co., Schenectady, N. Y., was re-elected president of the Exhibitors Advisory Council. Mr. Shugg is well-known in the rock products industry through his services in connection with conventions and exhibits of the Associations.

Managing Director

A LETTER from a well-known and well-liked American comes to hand from Johannesburg, South Africa, on the letterhead of the Anglo-Alpha Cement Limited, signed R. B. Dickinson, managing director. His many friends in the U.S.A. will be delighted to know that "Bob" Dickinson, formerly of the Marquette Cement Manufacturing Co., Chicago, is thus the British equivalent of president of his company.

The Anglo-Alpha Cement Limited is a merger of the Anglovaal Cement Co. and the Atlas Cement Co., which became effective about the first of the year 1937. The Anglovaal company has a plant just outside of Johannesburg, which had been operating about a year, and the Atlas company has a plant in the Orange Free State about 150 miles south from Johannesburg. Both plants are in full operation and produce about 1,250,000 bbl. per year.

There are two other cement companies in South Africa and the total production is about 6,000,000 bbl. per year. Cement is packed in 94-lb. paper bags, the same as in the United States; prices are quoted per bag, or in local parlance "per pocket," the average price being about 50c (in U. S. currency).

European Traveler

ERIC W. RYBERG, president of the Utah Sand and Gravel Products Corp., Salt Lake City, Utah, has been in Europe since early in October, automobile touring with Mrs. Ryberg and three of his daughters Eunice, Afton and Enid. The oldest daughter Gertrude met them in Copenhagen, Denmark, where she is living temporarily.

The Rybergs spent considerable time in Norway, Sweden and Denmark, the ancestry of Eric being Scandinavian. He visited a number of sand and gravel operations and ready-mixed concrete plants and found them very interesting, although much smaller than

—Photo by Blank and Stoller
Eric W. Ryberg

American plants. They are always clean and well kept up.

Mr. Ryberg's latest letter from Paris, France, tells of his trip through Germany, where he found producers of rock products rather uncommunicative and suspicious of foreign visitors, or at least fearful they might say something that would "get them in wrong."

● ● ●

E. G. BAILEY, vice-president of Babcock and Wilcox Co., New York, N. Y., recently had the honorary degree of doctor of engineering conferred upon him by Lehigh University, for "Notable and distinguished accomplishment in the field of combustion and steam engineering." Mr. Bailey also is president of the Bailey Meter Co., Cleveland, Ohio. In addition to his engineering accomplishments, Mr. Bailey also has presented scientific papers to various associations. One of his most recent contributions of this sort was a paper entitled, "Projection Lines for Coal Research" given before the American Mining Congress on May 19, 1937.

Obituaries

J. HARVEY BORTON, a director of the Pennsylvania Crusher Co., Philadelphia, Penn., died on October 30.

●

FRANK T. LEWIS, who was engaged in the sand and gravel business at Nashua, N. H., died on November 25 at the age of 78. In addition to his business activities, Mr. Lewis had served in the State Legislature, and as an alderman, fire commissioner, and member of the Board of Public Works of Nashua, N. H.

●

HARRY E. WEST, president of the H. E. West Sand Co., Muskogee, Okla., was killed recently in an accident at his sand plant when he was struck by a pulley block. He was 67 years old. Mr. West was president of the Central Pan-American Highway Association, and was active in promoting the good roads movement.

●

WALLACE L. WOLF, a director of the Standard Slag Co., and vice-president of the Seiple-Wolf Construction Co., both of Youngstown, Ohio, died November 16 at Riverside, Calif. Mr. Wolf had left Youngstown for California with Mrs. Wolf for an automobile tour, and became ill at Riverside.

●

JAMES H. EVANS, who for many years operated the Idaho Lime Co., Evans, Wash., died recently at La Jolla, Calif. He sold his property over a year ago, due to his failing health, and had been living in Arizona and California.

●

HOWARD A. ELLIOTT died on November 30. He was vice-president and general manager of Materials Delivery Corp., New York, N. Y., sand and gravel dealers, and vice-president of Nassau Sand and Gravel Co., producers and wholesale distributors. He was 59 years old. Before he entered the sand and gravel business, Mr. Elliott was general traffic manager of the George A. Fuller Co., and prior to this connection was in the passenger traffic department of the Pennsylvania Railroad.

●

JOHN S. JACKSON, a pioneer in the slate industry died at Pen Argyl, Penn., at the age of 92. Mr. Jackson was born in England, and before coming to this country in 1864, worked in the slate quarries of his native land. On arriving in this country, he went to Pennsylvania and opened the Bethlehem slate quarry. Later he settled at Pen Argyl, and operated the Stephen Jackson Slate Co., and then became president of the Jackson-Bangor Slate Co., the position he held at the time of his death.

· NEWS · OF · THE · MONTH ·

Opposes Annual Wage

WILLIAM GREEN, president of the American Federation of Labor, is violently opposed to President Roosevelt's suggestion that an annual wage be established in the construction industry. Mr. Green says that any reduction in building costs resulting from an annual wage plan will be purely nominal, since it would be offset by increased overhead and operating charges, and that it would aggravate rather than relieve unemployment, would seriously dislocate and cripple construction activity and would undermine the industry's wage structure with resultant economic instability and social discontent.

Mr. Green said further that the largest portion of economic waste in the building industry is still attributable to the practice of competitive bidding in spite of some improvement. He said: "When considered together with other factors in the cost of construction, it is difficult to understand how the current building lag can be attributed to the wage levels secured and maintained in this industry by building mechanics and building laborers."

This seems to be quite in line with Mr. Green's various other arguments dealing with economics.

Quits Production

EASTERN OHIO SAND & SUPPLY CO., East Liverpool, Ohio, is reported to have abandoned its operations in favor of the T. Milliron Transfer & Storage Co., Inc., which has a river terminal and was at the foot of Union Street. Insufficient business to warrant operations of two concerns was given as the reason for this decision. The Milliron company will continue to handle sand, gravel and cement of the Dravo Corporation, of which it is a subsidiary. The Eastern Ohio Sand & Supply Co. began operations 20 years ago as the East Liverpool Sand Co. The business was subsequently acquired by the Eastern Ohio Sand & Supply Co., a subsidiary of the Keystone Sand & Supply Co., of Pittsburgh, a Dravo Corporation subsidiary, in June, 1929.

Restraining Injunction

THE STATE OF FLORIDA has been enjoined by the Federal Court from enforcing the state law requiring inspection of foreign cement at 15c per hundred pounds. Cordell Hull, Secretary of State, Washington, D. C., stepped into the case to denounce the law as interfering with some of his foreign trade agreements. The case was brought originally into the Federal Court by the Bimi Trading, Inc., New York City, an importing concern.

Faux Pas

AN ATTORNEY representing the Pennsylvania crushed stone producers, in a hearing before the State Industrial Board, in asking for exemption from the state's new 44-hour week law, is reported to have referred to crushed stone as a perishable commodity—very much to the amusement of sand and gravel and slag producers.

Over-rated Hazard

NEW YORK STATE, according to an article in the *American Labor Legislation Review*, has had but six awards for silicosis in the first full year of operation under the silicosis amendment to the State Workmen's Compensation Act, and the total damages paid amount to but $4,535.

Asphalt Subsidiary Started

PORTSMOUTH ASPHALT CORP., Portsmouth, Ohio, a subsidiary of the Portsmouth Sand & Gravel Co., has started manufacture of blacktop for highway construction. The plant exterior, at Fourth and Madison Streets, has been completed, with the steam power plant and offices under roof, but the gasoline crane, mixer and drier are in the open. Sand and gravel, of course, are furnished by the parent company.

Unionized

WASHINGTON - IDAHO LIME PRODUCTS CO., Orofino, Idaho, employes are reported to have been organized as a local of the Cement Workers' Union of the American Federation of Labor.

Bonus

IDAHO PORTLAND CEMENT CO., Inkom, Idaho, on December 6 paid a bonus of 25 percent of each employe's year's pay, amounting in all to $20,000, according to West Coast newspaper reports.

CALIFORNIA PORTLAND CEMENT CO., Colton, Calif., paid a Christmas bonus of $12 to $25 to each of its more than 600 employees.

Wins Suit

UNITED SAND & GRAVEL CO., Morrisville, N. J., won the suit brought by the Morrisville Borough officials under zoning laws to restrain the company from further operations.

Condemned

INDIANA GRAVEL CO., Indianapolis, Ind., has been ordered to remove its plant from White River near 14th St. by April 15. The property was condemned by the Indianapolis Flood Control Commission as part of a White River straightening project.

Damage Suit

MAKINS SAND & GRAVEL CO., Sulphur, Okla., is being sued in Murray County District Court by property owners below the plant for allowing silt to flow into a small stream.

Wharf

CAROLINA SAND & GRAVEL CO., Augusta, Ga., has applied to the United States War Department for permission to construct a wharf in the Savannah River near Augusta.

Contract

COLUMBIA CONSTRUCTION CO., Dale, Wash., has been awarded a contract for nearly half a million tons of stone for construction of the Columbia River jetty.

Strange Theft

WOODWARD IRON CO., Birmingham, Ala., operators of a limestone quarry, reported recently to local police the theft of a steel rock crusher which was dynamited from its base and trucked away in the night, presumably for scrap steel.

Winter Sand

ICE AND SLEET deposited in December on many central west highways is calling for a considerable tonnage of sand for use at intersections and other dangerous points.

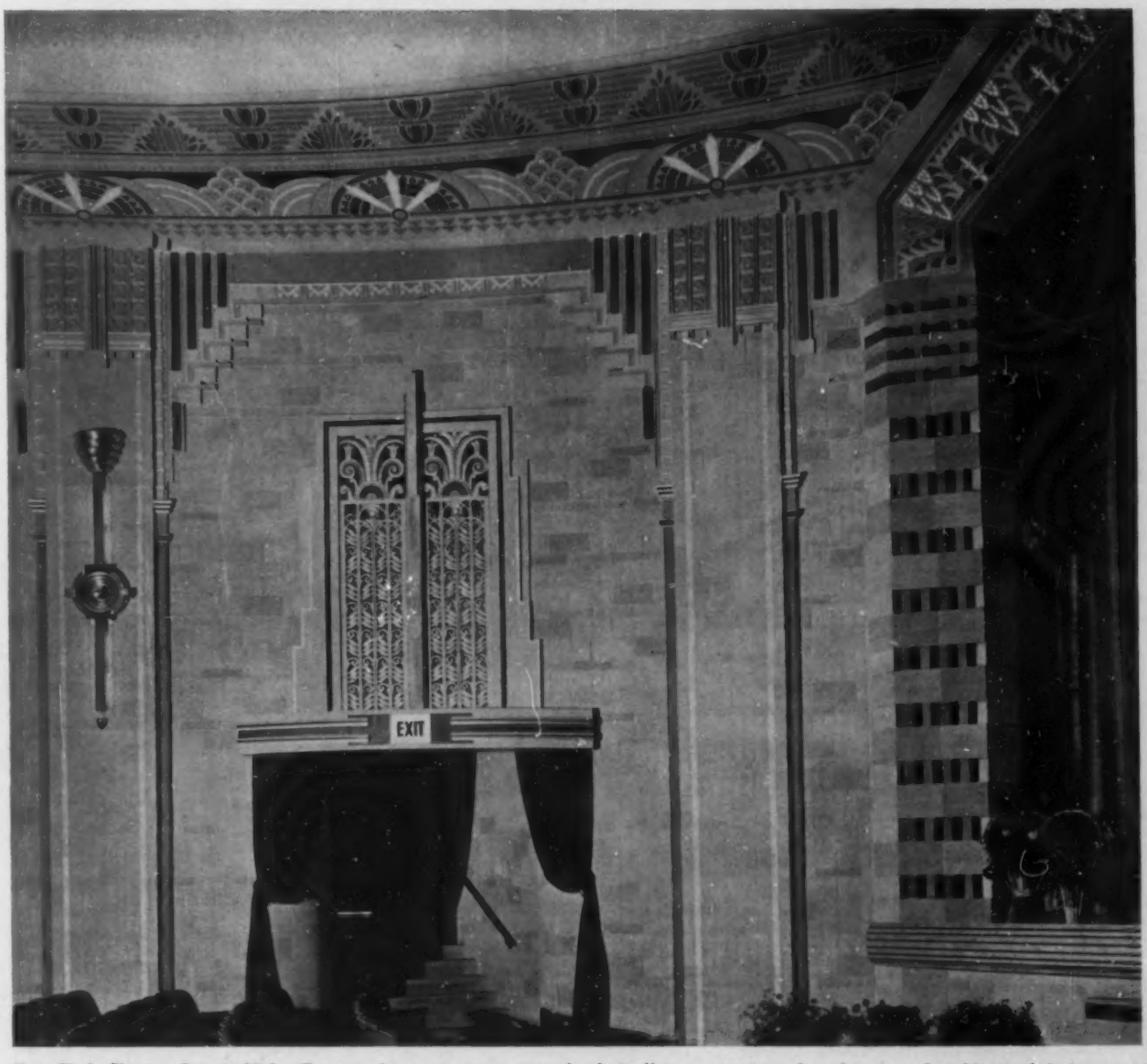
Contract

HARCO CONSTRUCTION CO., Mount Ayr, Ia., will open a quarry north of Grand River to supply crushed stone for county highways.

(Continued on page 115)

Concrete Products
Cement Products
TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Artistic Design in Concrete Masonry



New Circle Theater, Detroit, Mich., illustrates how concrete masonry lends itself to construction where beauty and architectural design are of utmost value. Scalloped 4-in. cinder units alternated with standard cinder concrete block result in a pleasing effect. Vertical and horizontal joints are in a continuous line. Units were manufactured by Cinder Block, Inc., Detroit

The Latest in Methods, Materials and Equipment Awaits You—at the

CONCRETE INDUSTRIES EXPOSITION

Sponsored by

National Concrete Masonry Association

American Concrete Contractors Association

Here you will see the greatest display of concrete machinery, equipment and materials ever assembled. Every well known product of the concrete industry will be on display.

Don't miss this golden educational opportunity to meet with the nationally known leaders of the industry. Come and learn about new, improved methods that will give you new ideas that you can apply to your own business in 1938.

Plan NOW to attend these conventions to take place simultaneously with the

Concrete Industries Exposition

Come to the Four Big Events . . .

1. The National Concrete Masonry Association Convention
2. The American Concrete Contractors Assoc. Convention
3. Cast Stone Institute Convention
4. Concrete Industries Exposition

FEBRUARY 8, 9, 10, 11, 1938

at the

Sherman Hotel

Chicago, Illinois

Straight Line Production Methods of

CASTING STONE VENEER CONCRETE

From An Interview With

M. W. BRADBYER

Pres., The Instone Co.

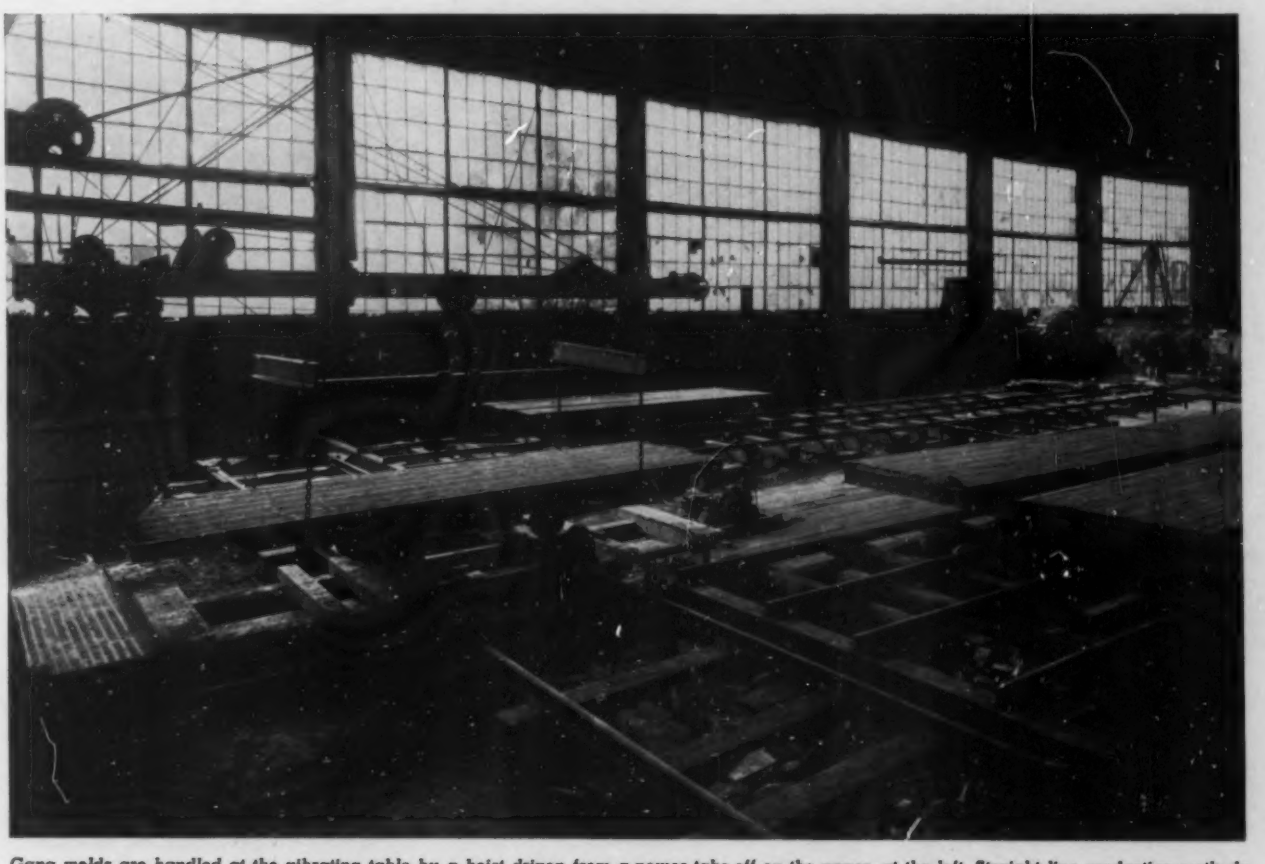
ABILITY TO CAST LOAD-BEARING CONCRETE building units with a high grade natural stone veneer face again demonstrates the versatility of concrete for construction. By building homes with these units, the average home-builder can now have a first-grade stone exterior house at a cost to him not greater than that for other masonry construction and in addition have the advantages of light weight, and high insulating and low absorption value of the concrete back up.

The Instone Co., Hammond, Ind., of which Mr. M. W. Bradbyer is president, has been making the units for six months at a new plant, under the McKenzie patent licensed by Frank Navratil, 931 Wilcox St., Hammond, Ind., and is equipped to produce 1000 ft. of wall area a day by straight-line methods of operation. The unit is designed to give all the advantages of a beautiful veneer along with the natural advantages of light weight concrete, while doing away with the disadvantages of each when used separately.

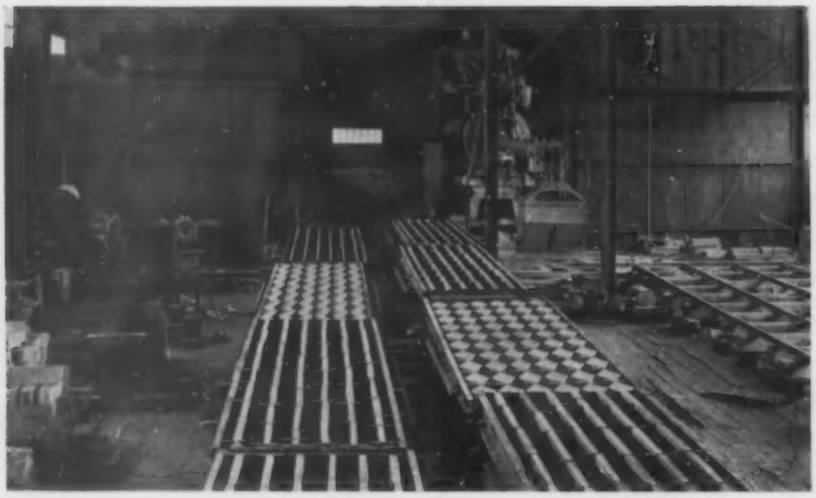
Equipment has been installed in a 60-x175-ft. building where steel tanks were formerly manufactured. Concrete aggregates are shipped in by rail and stored in three bins of 100-cu. yd. capacity in one end of the building, adjacent to a 21 cu. ft. mixer.

All units are cast and vibrated, using ⅜ to ½-in. Waylite coarse aggregate and ¼ to 0-in. Waylite fine aggregate, mixed with a small percentage of limestone screenings. In vibrating concrete, this concern has found that the addition of a small amount of limestone screenings increases the workability in the forms and is instrumental in reducing harshness. Aggregates are measured in wheelbarrows and dumped into the mixer hopper.

The forms are made up in the opposite end of the building from the mixer, and near another railroad siding where stone is unloaded. The stone used



Gang molds are handled at the vibrating table by a hoist driven from a power take-off on the paver, at the left. Straight line production methods are followed throughout, by the use of cars and track, in the manufacture of concrete-stone units



A series of molds, with stone facing in place, ready for the pouring operation. Note the length spacers and the diamond-shaped stone in the center gang molds. After pouring and curing, these units are each split diagonally to make four corner units

for veneer is the Briar Hill golden Ashlar sandstone, a nationally known quality stone used for over 60 years in the construction of fine homes. The compressive strength of this stone, which is shipped from Glenmont, Ohio. is 5000 to 6000 p.s.i.

Production Methods

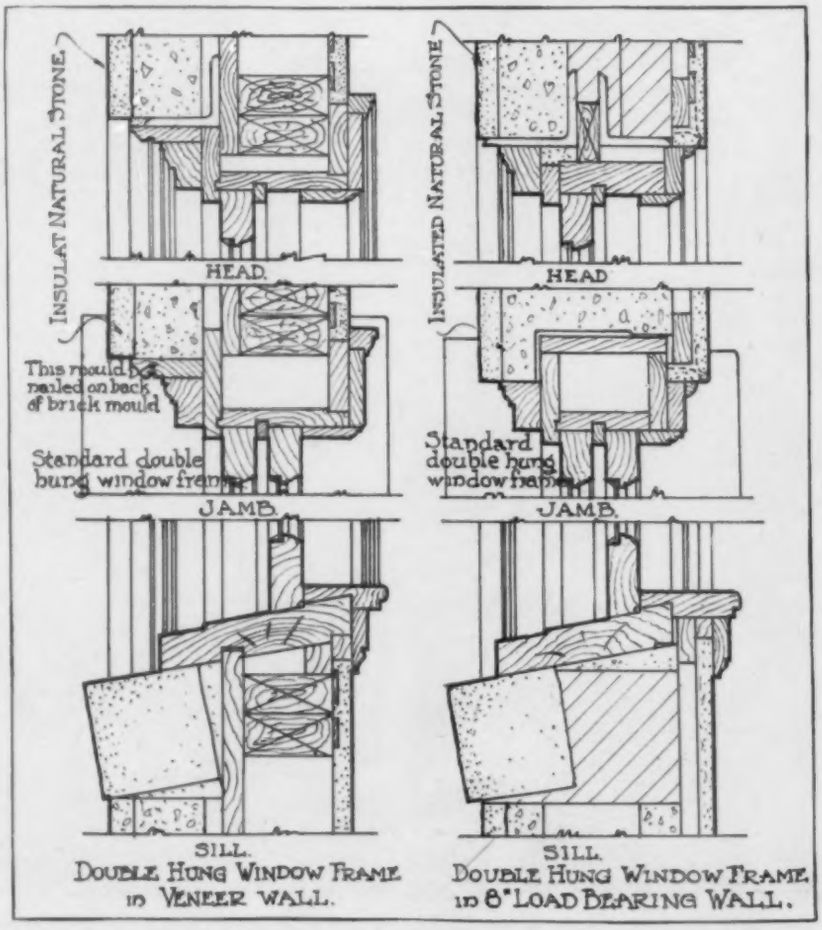
All units are made in 16-ft. steel gang molds with spacers placed to give units of variable lengths. "Instone" 4-in. veneer is sold on the basis of wall area and is cast in the molds in 5-in., 2¼-in. and 7¾-in heights—these sizes being brick sizes and multiples thereof.

The Briar Hill stone is shipped to the plant in 4-in. thicknesses, and is split in two by a patented splitting machine before it is placed into the forms. In the splitting operation, the stone is laid longitudinally over a stationery knife edge in the machine and a movable knife edge is brought down from above to rest on the stone to be cut. A 200-lb. blow traveling 6 in. is then struck, splitting the stone into two 2-in. halves. The percentage of imperfect fractures is less than 5 per cent.

These 2-in. thick lengths of stone are laid in the forms and rigidly fastened so that a 3 in. thickness of Waylite concrete may be poured on each side of the stone, giving a 2-in. thickness of stone with 3 in. of lightweight concrete on each side. The forms and veneer stone are placed in readiness for the concrete pouring operation on small cars, which travel on 36-in gauge track the length of the building to the mixer. Here, the car is transferred to another track laid at right angles to the first track and placed in front of the mixer so that the mixed concrete can be discharged directly into the forms from its bucket traveling above, on the boom.

This transfer track is of standard gauge and runs across the vibration table, but does not rest on it. The form on a car is run onto the transfer car which in turn is moved on the transfer track to a point directly over the vibration table. The form is then raised by a hoist which provides a four-point vertical lift. This hoist is driven from a power take-off on the mixer. After lifting the form, the transfer car, on which the form car rested, is pushed out from underneath, and the form is lowered onto the vibration table. This process is reversed when removing the vibrated forms. Time required for placement or removal of forms is about 30 seconds.

The vibrator is built from a vibration unit furnished by the Electric Tamper and Equipment Co., Ludington, Mich. It is driven by a Ford four cylinder gas engine through three groove, V-belt pulleys. The vibrations are of the impulse type. They are created by three double disk off-center eccentrics which are mounted on 4-ft. centers on a 12-ft. shaft below the table. The shaft is mounted on a 12-in. channel with seven pillow block bearings. By the use of a 3-speed engine with adjustable throttle, the amplitude of



Details of window framing, showing the uses of special sizes of stone veneer

vibration may be varied from zero to ½-in. and the frequency range is 1000 to 5000 pulsations per minute. Normally, the frequency used is from 3400 to 4200 vibrations per minute, the number varying proportionately to the thickness of the units being manufactured.

Concrete is poured from the mixer bucket into the forms and the filled form is vibrated. Then the form is raised by the hoist, the transfer car is placed under it, and the form is lowered and moved to the side of the building. From this point, it is transferred to another 36-in. gauge track and pushed to the other end of the building for curing under wet burlap. The complete operation takes about five minutes. Two parallel 36-in. gauge tracks are provided on each side of the building to transport the forms. About 90 sq. ft. of wall surface is made in one operation with the 7¾-in. size; 44 sq. ft. of the 5-in. size; and 20 sq. ft. of the 2¼-in. size.

A semi-wet, rich concrete with a slump of ¼ in. or less is used. The stone facing has an absorption ratio of six per cent which is ideal for bonding surfaces. With high frequency vibration and a rich mixture, there is a definite penetration of the cement paste into the stone.

After several days of inside curing, the forms are moved on skids to a hoist with a swinging boom which places them into trucks for storage in the yard. When ready for shipment, the units are placed in the stone splitting machine and sheared longitudinally, producing a veneer faced unit with a 1-in. thickness of stone backed by 3 in. of concrete. After splitting, the two stone faces are placed back together and delivered to the job so that the natural split stone faces will be clean and free from blemishes. For making corners, diamond-shaped stone, 8-in. on a side, are placed in the forms, concrete is poured and vibrated and after curing it is split through both diagonals. A ¾-acre tract of land is provided for storage and air curing.

Test Stone Veneer Bond

Before the company began the manufacture of these units, the market possibilities and the structural and economical advantages of the "stone-concrete" units were thoroughly investigated. Specimens were tested at the Rose Polytechnic Institute, Terre Haute, Ind., to determine the resistance of units with a backing of 1:6 mix of cement and Waylite, under cycles of freezing and thawing.

Three units were tested by placing them in a refrigeration can for about four hours at a temperature of about 0 deg. F. and then plunging the units into hot water for thawing. Specimens Nos. 1, 2 and 3 were passed through 37, 66 and 100 cycles, respectively, of freezing and thawing. This treatment had no noticeable effect on the specimens, and a crushing test of these units to the point of failure of both the stone and concrete backing indicated no fracture in bond. The crushing data were as follows:

CRUSHING TEST DATA

Spec. No.	Freezing & Thawing Cycles	Plan. Dimen.	Plan Area	Height	Crushing Load Lb.	Strength Lb./sq. in.	Strength Lb./sq. ft.
1	37	5.5x3.8	20.9	5.0	44,800	2140	308,000
2	66	5.7x3.7	21.1	4.9	40,000	1900	273,000
3	100	5.0x3.7	18.5	4.8	25,900	1400	202,000

While the stone is absorptive to the rich cement paste, the 1-in. veneer is claimed to have the permanence of solid stone, and to become highly resistant to moisture on exposure to the atmosphere. With a 3-in. backup of concrete, one-third lighter in weight than sand and gravel concrete, stone masons are not needed to lay "Instone." Any bricklaying mason can readily place the units, and ordinary portland cement mortar is sufficient since there are no free chemicals in the concrete with subsequent efflorescence.

"Instone" is claimed to have the advantage over solid stone in that the 3-in. Waylite concrete provides insulation superior to the usual masonry walls up to 12-in. in thickness. It is also made with a ½-in. lip at each end of each piece to

After curing, each standard unit is split, as shown, making two veneer block with an inch of attractive facing backed with three inches of lightweight concrete. Losses due to imperfect fractures are remarkably low

be trimmed by the masons for irregular vertical lines. Lengths are random with a maximum of 28 in. and an average of about 12 in. Regular concrete does not have very much insulating value, having a B.t.u. efficiency value of .54. Waylite concrete 3 in. thick, however, averages .26 B.t.u., or more than twice as efficient. This is due to the fact that Waylite is a steam aerated blast furnace slag, made by a process that results in millions of air cells which are non-communicating. This cement paste covers the openings of these cells, furnishing the dead air necessary for insulation.

The Instone Co., has been licensed to manufacture the building unit and to have the exclusive merchandising rights for the Chicago area. "Instone" is retailed through building material dealers exclusively, and is sold by the square foot of wall area. Sizes furnished in a shipment are 60 per cent, 5-in. stone; 30 per cent, 2¼-in. stone; and 10 per cent, 7¾-in. stone. The building material dealer is allowed a commission of 15 percent, and shipments are made from the factory in Hammond, Ind., directly to the job. A price of 40c per sq. ft. has been set for 4-in. veneer stone units delivered within a 40-mile radius of Chicago's loop. Carload lots are shipped to more distant points where other manufacturing plants have not been established. Because of the lightness in weight, it is claimed by the manufacturer that the 4-in. veneer blocks may be shipped as far as Boston, Mass., for 55c per sq. ft. delivered to the job.

Sales Promotion

The Instone Co., while it retails through dealers, has its own staff which contacts architects, and contractors and builders, and circularizes the latter as well as the general public. Estimates on each job are drawn up by the company's architect and each job is serviced. Several houses are now being constructed of "Instone" in the Chicago area.

Controlling Vibration to Reduce Segregation

Considerable research is in progress on vibrated concrete, and the use of this method for the manufacture of concrete products has become more evident in recent years.

Developments in vibration are designed to control vibration so that segregation of aggregates may be eliminated. A recent advance in the use of vibration in making concrete products is soon to be announced by the Stearns Manufacturing Co., Adrian, Mich., which makes use of the principle of "limited amplitude" vibration. This process is said to be desirable in permitting the use of a low water cement ratio and a desirable fineness modulus.

It is claimed to give to the concrete unit the advantages of vibrated concrete without trace of separation of the coarse from the fine particles of aggregate. In this process concrete is placed in the mold box by a combination of vibration and jolting. Vertical vibration only is used and the travel of the mold box is limited to 3/64-in. By limiting the vibration to this figure, it is said that the large and small particles are nested and the jolting operation speeds the process and allows the use of a semi-dry concrete.

It is further claimed that concrete units made by "limited amplitude vibration" are denser, have greater strength, show less absorption and are manufactured with very favorable unit costs.

CENTRAL PRE-MIX CO., Spokane, Wash., H. D. Sullivan, manager, reports prospects bright for a good season in 1938. He said "Our concrete block business has taken a decided upturn. These blocks are becoming more popular every year with small builders."

6 REASONS for buying a STEARNS mixer

1. Heavy all steel construction in ALL sizes. 2. Mixing shell equipped with tough, wear-resisting steel, bar type liners that are easily and cheaply replaced. 3. Ribbon type mixing blades of "Sterloy" steel (paddle type optional). 4. Bearings—plain or ball type optional on ALL sizes. 5. Discharge door control is on operator's side—where it should be. Works easily without latches or catches—LOCKS TIGHT. 6. Lowest charging height of any concrete products mixer.

We also manufacture the famous Stearns Power Stripper and a complete line of concrete products plant machinery including parts and attachments for Anchor, Hobbs and Ideal machines.

STEARNS
MANUFACTURING CO. - ADRIAN, MICH.
GENE OLSEN, PRESIDENT

CASH IN ON BIG DEMAND FOR CONCRETE JOISTS

Over 12,000,000 square feet of concrete floors were laid in 1937, requiring an enormous number of concrete joists, and the demand continues.

Cash in on this profitable market with an R & L CRESCENT JOIST MACHINE. The 10-gang mold illustrated will enable you to dominate the building market in your locality for Precast Concrete Joists.

Be sure to see our complete display at the CONCRETE INDUSTRIES EXPOSITION in Chicago Feb. 8-11, or write for complete details about this profit making opportunity.

R&L CONCRETE MACHINERY CO.
KENDALLVILLE, IND.

Public Utility Steam Main Solves

WINTER READY-MIX PROBLEM

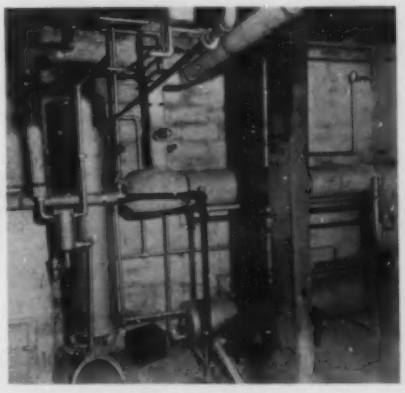
By BROR NORDBERG

WINTER OPERATION of a ready-mixed concrete plant has its difficulties and limitations, particularly in sections of the country subject to severe cold weather conditions. Many plant operators curtail their activities while others go to considerable expense to enclose the plant bins and install steam coils in the aggregate bins so that the aggregate will be free to flow, and also to heat mixing water. All these precautions are quite costly. It is also difficult to maintain practices insuring that the mixed concrete will reach its destination at temperatures at which concrete can be placed satisfactorily and have every batch in some conformity with others going into the same job.

It isn't very often that a ready-mixed concrete plant has the necessary mixing water delivered right to its door and ready for use at the desired temperatures, but that is the case of The Builders Material Inc., Cedar Rapids, Iowa, a concern that has been in the business for three years and had to furnish its own heated mixing water until the past winter.

Before the Iowa Electric Light and Power Co., ran a steam main in the vicinity of the plant, for the purpose of selling steam heat to industrial plants and offices, mixing water was heated by a company-owned boiler at considerable expense. In cold weather, two or three tons of coal were burned each day, and concrete temperatures were highly variable and uncertain. There were many days when the plant could not operate, a decided handicap in a city where about 90 percent of the concrete sold is ready-mixed concrete.

At the time the steam main was placed, this company was one of those



By turning the hand valve shown, steam condensate from the main is delivered into the water measuring tank

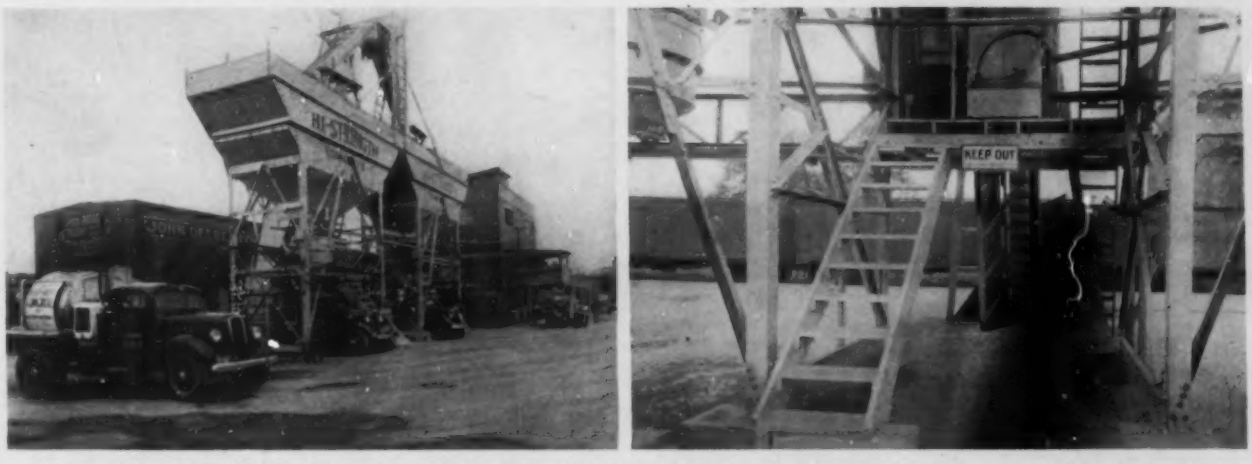
that decided to buy its steam for heating and the piping was installed in the basement of the office. Steam was to be paid for on a volume basis. It was then that the boiler for heating mixing-water was discarded, connections were made to the main in the office basement, and an arrangement was made to pay for steam condensate delivered in the office building basement at 212 deg. F.

Much of the piping to the water-measuring tank, at the concrete plant, is underground and the remaining 50 ft. of pipe was insulated. Just a turn of the hand valve and as much mixing water as desired is delivered into the truck mixers at 180 deg. F., while out-of-doors temperatures are in the neighborhood of zero. The concrete at 65 deg. F. or above can be delivered practically anywhere in the city (five miles) without any heating of the aggregate in the bins or any enclosure. Usually dry aggregate is available in the winter months, but any frozen gravel is thawed out when it comes into contact with the mixing water at 180 deg. F.

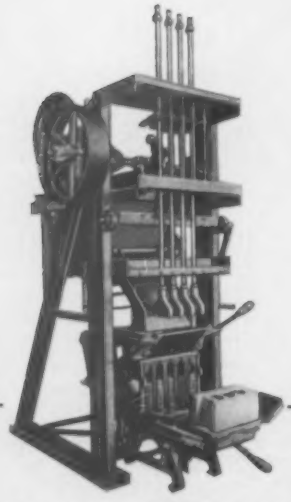
It is estimated by the owners that this fortunate arrangement has increased the company's business by 25 percent, and the cost of heating water per cubic yard of concrete has been reduced 75 percent.

The plant, of all steel construction, is located in the building material yards of the company. It consists of two Johnson bins partitioned so that either stone or gravel aggregate may be made available. Aggregate is purchased (the company no longer is a producer) and trucked to the plant, where a bucket elevator, 80-ft. centers, places it in bins. The total bin capacity is 250 tons of stone, gravel and sand.

Cement in sacks is shipped by rail to the warehouse, a separate building from the ready-mixed concrete plant. A home-made 24-in. belt conveyor, 20-ft. cen-



Left: All steel plant of The Builders Material Inc. Cement is placed in the truck mixers from the warehouse in the background. Right: Mixing water tank to automatically measure the water for each mix



"ANCHOR"

Complete equipment for making concrete, cinder and other light weight aggregate units, including engineering service for plants and revamping of old ones for more economical service.

Hobbs block machines, Anchor tampers, Anchor Jr. strippers, Stearns power strippers, Stearns mixers, pallets, Straublox Oscillating attachments, etc.

Repair parts for Anchor, Ideal, Universal, Stearns, Blystone mixers and others.

Anchor Concrete Mchy. Co.

G. M. Friel, Mgr. Columbus, O.

CEMENT COLORS

STAR and ANCHOR COLORS

Geo. S. Mepham Corp., East St. Louis, Ill.
C. K. Williams and Co., Easton, Penn.

CEMENT COLORS

Will not fade—extra fine and strong

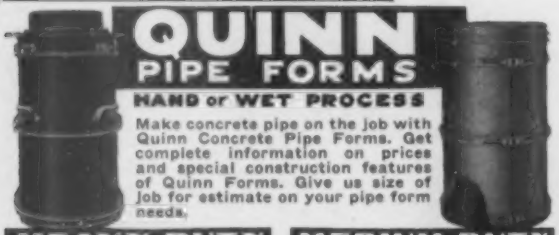
TAMMS SILICA COMPANY
228 North La Salle St. Chicago, Illinois

SPECIAL AGGREGATE

SPARKLING MARBLE
SPARKLING GRANITE

All colors—all sizes

TAMMS SILICA COMPANY
228 North La Salle Street Chicago, Illinois



QUINN PIPE FORMS

HAND or WET PROCESS

Make concrete pipe on the job with Quinn Concrete Pipe Forms. Get complete information on prices and special construction features of Quinn Forms. Give us size of job for estimate on your pipe form needs.

HEAVY DUTY

Built for many years of service—sizes for any diameter pipe from 12 to 84 inches—any length—tongue and groove or bell end.

MEDIUM DUTY

Makes same sizes pipe as "Heavy Duty" but built to meet demand for lower cost equipment to produce uniform quality in smaller amounts.

Also manufacturers of concrete pipe machines for making pipe by machine process.

QUINN WIRE & IRON WORKS 1603 12 St. Boone, Iowa

ANNOUNCING

February issue of ROCK PRODUCTS will contain specially prepared articles reviewing progress and developments in the concrete products industry.

ters, is extended from the cement storage floor into the box cars for unloading. With two men working on each end of the conveyor, 40 to 50 sacks of cement per minute are unloaded into bins.

Cement is emptied into a rubber-tired cart (Concrete Construction Co., Waterloo, Iowa), of 17-cu. ft. capacity, and is wheeled to a spout and discharged into the truck mixers. High early strength cement is used exclusively at this plant.

Aggregates are weighed by a Jones and Loughlin scale in a hopper (Johnson) traveling on rails beneath the bins. Water is measured automatically for each batch in a 120-gal. measuring tank. After receiving the charge of aggregates and water, the truck mixers are driven a few feet to the cement loading spout. Four Ford trucks with Jaeger 1½-cu. yd. truck mixers make the deliveries.

A recent outstanding job was the continuous concrete pour for the grain bins and warehouse of the Quaker Oats Co. Twelve days and nights were needed to deliver 3960 cu. yd. of concrete for these structures. On city paving work, 225 to 250 cu. yd. of concrete are being delivered each 8-hr. day by the four trucks with an average haul of 1¼ miles.

Arthur Barlow is president of the company, E. J. Nelson is secretary, Wencil Rance, vice-president, C. R. Fahrney, treasurer, and M. H. Wagner, superintendent.

Enterprise

PYRAMID GYPSUM CO., Salt Lake City, Utah, is manufacturing and marketing a new concrete product made from volcanic cinders, at Jerome, Idaho. The manufacturing methods involved includes a floatation process by which the lava rock is separated from the cinders. The product made is light weight and has insulating properties. Besides brick, the plant will make reinforced-concrete ceiling and floor joists, and an insulating and acoustic plaster with gypsum binder. Leonard Christophensen is superintendent.

Improvement

OREGON LIME PRODUCTS CO., Williams Creek, Ore., is installing a hydrating plant to cost approximately $13,000.

Merchandising

MILWAUKEE CONCRETE PRODUCTS ASSOCIATION sent out invitations the second week in December to realtors, architects, builders, contractors and masons to inspect a concrete dwelling under construction on Kurtis Drive, Elm Grove, which has been erected as a demonstration home. The construction includes concrete block walls, cement painted exterior, reinforced-concrete floor joists, precast concrete stairs, concrete tile roof, colored concrete bathroom floor and concrete block fireplace and mantel. Walter A. Sherman, secretary of the association, in his letter of invitation said: "Concrete homes offer sturdy, firesafe construction in any type of architecture at reasonable cost. The points we will emphasize are good design, rigid floors, substantial walls, freedom from repairs, firesafe economy, resistance to storms, decay and termites, low maintenance, high resale value and safe mortgage risk."

WEST BEND CONCRETE PRODUCTS CO., West Bend, Wis., has begun construction of a five-room all concrete masonry firesafe home of the two-story Cape Cod type as a demonstration of its product. The exterior is lightweight concrete masonry painted or stuccoed, and firred, insulated and plastered on the inside with reinforced concrete first floor and lightweight concrete masonry partitions.

American Concrete Institute Meeting

THE AMERICAN CONCRETE INSTITUTE will hold its annual meetings at the Palmer House, Chicago, Ill., on February 21 to 24, inclusive. This meeting will draw a large attendance of cement manufacturers, concrete products producers, highway engineers, and others interested in the use of concrete.

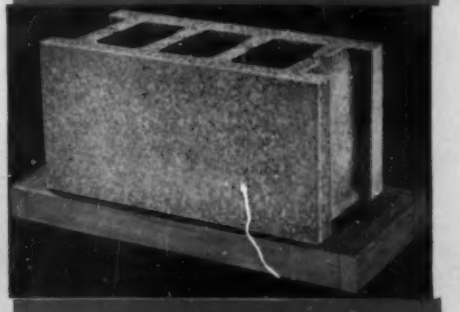
Concrete Pavement Yardage

Awards of concrete pavement for November, 1937, have been announced by the Portland Cement Association as follows:

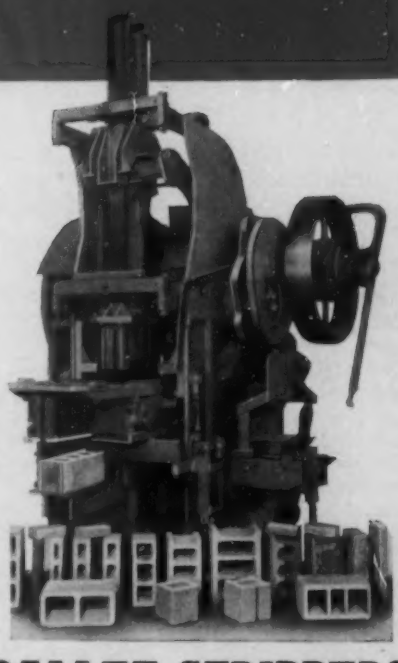
Type of Construction	Sq. Yd. Awarded during Nov., 1937	Total sq. yd. for year to date Nov. 27, 1937
Roads	2,319,836	37,366,949
Streets	780,458	12,259,273
Alleys	60,828	529,826
Total	3,170,122	50,156,048

YOUR GREATEST OPPORTUNITY FOR INCREASED EARNINGS

Mr. Frank Romano is happy because his products plant, the Rhode Island Cinder Block Company, has grown and prospered by making FULLY PRESSED TOP units on BESSER PLAIN PALLET STRIPPERS.



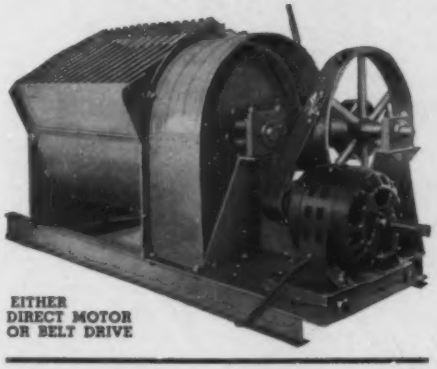
You can earn more profit making units with FULLY PRESSED TOP. This better product has a bigger market. Production cost is even lower on the new Besser Plain Pallet Strippers. Besser Automatic Strippers with no hand controls to operate and pallets and blocks easier to handle give the lowest per block production cost of any machine. Besser Plain Pallet Strippers are the only machines making all sizes and types of units ON ONE SET OF PLAIN PALLETS —either wood or steel. The savings gained on pallets, even when no more than three or four sizes are made, is as much or more than the cost of the machine itself. You save money when you buy a Besser.



BESSER BATCH MIXERS

In All the Standard Capacities

5, 12, 18, 25, 30, 40 and 50 Cubic Feet



EITHER DIRECT MOTOR OR BELT DRIVE

BESSER PLAIN PALLET STRIPPERS

FULLY AUTOMATIC—3 Models—Capacities: 2000 to 4000 units per day.
SEMI-AUTOMATIC—4 Models—Capacities: 1000 to 2000 units per day.
POWER OPERATED with Hand Controls—2 Models—Capacities: 500 to 1000 units per day.
MULTI-MOLD—Hand Operated—Capacities: up to 300 units per day. For manhole blocks, brick slabs and small cored units.
AUTOMATIC BRICK MACHINES—Capacities from 10,000 to 50,000 units per day. For brick, slabs, coal cubes and other small units.

Write for Besser Plain Pallet Stripper Catalog

COME

Besser Manufacturing Company are owners of all patents ever granted on concrete stripper block machines using plain pallets. These patents completely cover the basic Plain Pallet Stripper principle. No firm or individual is licensed or allowed to make machines under any of these patents.

BESSER MANUFACTURING CO.

COMPLETE EQUIPMENT FOR CONCRETE PRODUCTS PLANTS

Complete Sales and Service on BESSER, ANCHOR, CONSOLIDATED, IDEAL, HOBBS, UNIVERSAL, PORTLAND

201 38TH STREET **ALPENA, MICHIGAN**

We would like to meet you and show you the Besser exhibit at the Convention of National Concrete Masonry Association and Concrete Industries Exposition, Hotel Sherman, Chicago, Feb. 8, 9, 10, 11, 1937.

Securing A Larger Share of the
MARKET FOR SMALL HOUSES

As told by W. D. M. ALLAN

Director of Promotion, Portland Cement Association

THE PORTLAND CEMENT INDUSTRY has made an excellent showing in obtaining a larger share of the small house market than ever before; and through the promotional efforts of the Portland Cement Association it aims to gain a still larger share. These promotional efforts are aided by local concrete contractors, concrete products producers, and where they are not now, they should be aided by sand, gravel, crushed stone and slag producers, because it means development of a major market for them as well as cement manufacturers in the years to come.

W. D. M. Allan, director of promotion, Portland Cement Association,* outlines the work done and the work projected as follows: The reasons why people who can afford it, do not build homes is due in part to high real estate taxes, general business uncertainty, large unemployment and the depletion of family reserves.

Prospective buyers also have been repeatedly told by the building industry that they can get a factory-made house with all modern conveniences at about one-half the price they would pay for a house constructed by ordinary methods. This misstatement of the facts was given as one of the retarding causes.

Another reason given why people do not build houses is that too many of their friends who did buy during the previous building boom are thoroughly soured on what they got. House buyers are being educated to know the requirements of good construction and will not be satisfied with houses which begin to sag and crack in a few years, have high maintenance expense, and have little or no re-sale value.

To put house building on a sound basis, Mr. Allan said that public confidence in home ownership must be restored and that house building organizations must be developed in each community to combine as many as possible of the various transactions necessary to provide houses, including the acquisition and improvement of real estate, construction, financing, insuring and selling of houses. He said that it was important that manufacturers of building materials and equipment devise efficient, low cost methods of using their products, and assist in training the various crafts in their proper use, so that high prices will not be quoted due to ignorance.

The P. C. A. Program for 1938

In outlining the P. C. A. program for 1938, Mr. Allan said that every effort will be made to build public confidence in home ownership through national advertising, literature distribution and personal contact with key buyers, pointing out that homes properly designed and built are a sound investment. Every effort is to be made to encourage financing agencies to demand rigid inspection of houses which they finance. Another plan is to work with realtors in various communities to help them use concrete economically for various parts of home construction.

In discussing activities of the Association, Mr. Allan said that extensive research had been conducted to develop economical ways to use concrete and that the best type of proved construction now available is concrete masonry for walls and precast joists for floors and roofs. He said that the development of precast concrete joists has cut about 30 percent from the cost of concrete floor construction in residences, due mainly to the elimination of form work, and that this type of floor is now on a competitive basis with ordinary construction.

The tests conducted by the Association to determine the resistance of masonry walls to water penetration were described. In these tests water has been jetted across a tunnel in which a wind velocity of 60 miles an hour is played against various kinds of walls. Conclusions based on these experiments are that two coats of portland cement paint properly applied to such walls, covering the mortar joints as well as the units, renders them water-tight even with rains of cloud-burst intensity and hurricane velocity; that portland cement paint used for making walls more resistant to water reduced the cost of concrete wall construction at least six cents per square foot as compared to walls with weatherproofing methods previously used.

Underestimate Construction Costs

Mr. Allan said there is a tendency for owners to use more and higher priced plumbing, heating and lighting equipment when building concrete homes, and cautioned builders to consider carefully the cost of these types of equipment in discussing costs. Because of this tendency to underestimate the costs of this equipment, it has been difficult to quote a low price on a concrete house, as the cost of the structural part of a house generally represents less than 50 percent of the total cost.

"Factory-Built" Houses Fabricated at the Site

In describing the Association's work on factory-made houses, Mr. Allan described a method whereby the "factory" will be moved to the home site and the concrete houses will be fabricated on the job rather than at some other location and moved to the site.

Briefly, this method of construction involves the building of an adequate foundation and first floor. The walls for the house are cast in a horizontal position on the floor, one at a time. Four or 6-in. form boards are laid on edge as the outside form for the wall; insulation is then placed on the floor, and conduits, window and door frames are tacked to the insulation. Insulating reinforced concrete is then placed and the walls are finished with large floats similar to those used for sidewalks and paving.

Any kind of color or texture can be had within a minimum amount of time. When the wall is 24 hours old, a specially designed hoist is used to raise it to a vertical position, full-story height and wall length, in one piece. This type of construction eliminates almost all form work and permits the placing of any size doors, windows or other openings in the walls without cutting or fitting. When all four walls are erected, they are fastened with a reinforced concrete tie at the corners to make a completely reinforced concrete wall.

* Paper read at National Conference on Local Residential Construction, Washington, D. C., November 18, under the auspices of the Chamber of Commerce of the United States.

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Plans for Concrete Masonry Convention

MODERN MERCHANDISING and production methods will be given a thorough going over for the benefit of concrete products manufacturers and other groups interested in concrete during the week of February 7 to 11 in Chicago. The occasion is Chicago's second annual concrete week when delegates of the National Concrete Masonry Association, the National Cinder Concrete Products Association, the Cast Stone Institute and the American Concrete Contractors Association will meet.

Meetings of the Cast Stone Institute will be held at the Medinah Club. All other sessions and the Concrete Industries Exposition are to be held at the Sherman Hotel. Program committees have engaged recognized leaders in every branch of their industries to discuss and demonstrate the newest developments in building and the selling of concrete structures.

Starting with an explanation of how the U. S. Housing Act of 1937 will function, speakers will analyze markets, outline effective selling plans, and discuss developments in the construction of concrete masonry houses and reinforced concrete houses. These talks have been outlined to provide information which manufacturers, as well as builders, can utilize in making their efforts more profitable.

One of the principal speakers will be Bernard Johnson, editor of the *American Builder*, who will discuss "Today's Building Costs and Building Values". Manufacturers of concrete products will get their slant of the housing story from a special paper, "The Housing Market—Fitting our Products to that Market."

Albert E. Bill, progressive Detroit builder of concrete houses, will develop the practical side of building with concrete masonry by describing his broad and successful experience in a talk, "The Firesafe Concrete House as a Profitable Enterprise for the Operative Builder".

Other subjects of direct interest to all concrete products manufacturers will be discussed in special concrete products sessions. "Do We Need More Equitable Fire Insurance Rates on Concrete Masonry Construction?" is the subject to be presented by P. M. Woodworth, engineer and housing consultant of the Portland Cement Association.

Other discussions will include papers on "The Need of Standardized Textures for Concrete Masonry Units", "What Stock Sizes Are Necessary to Properly Service a Concrete Masonry Job" and "The Use of Reinforcement in Concrete Masonry Construction."

In other sessions devoted to manufacturing, steam curing and electrical curing will be thoroughly discussed. Prefabrication, which is of interest to many products men, will be covered in the subjects, "The White System of Precast Slab Floor Construction," and the "Use of Prefabricated Sections in Floor Construction". A complete program will be published in the February issue of ROCK PRODUCTS.

Silo Convention Points to New Market

ABOUT 70 REPRESENTATIVES of silo manufacturers gathered at the La Salle Hotel in Chicago, November 29 and 30, for the 25th annual convention of the National Association of Silo Manufacturers. The program was highly diversified and featured papers by outstanding authorities on farm subjects.

W. W. Gurney, Pres. National Association of Silo Manufacturers

W. W. Gurney, Madison Silo Co., Winona, Minn., was elected president and F. L. Christy, Marietta Concrete Co., Marietta, Ohio, is the new vice-president. Re-elected officers are Z. W. Craine, Craine, Inc., Norwich, N. Y., secretary-treasurer, and Prof. A. L. Haecker, Lincoln, Nebr., research secretary.

Discussions in the various sessions revolved around trends in farming practices and the effect which they will have on the future of the silo industry.

Prof. J. B. Fitch, Chief of Dairy Husbandry Div., University of Minnesota, in a paper "Educational Silo Publicity versus Practices That Unsell the Silo," placed emphasis on the importance of familiarizing silo salesmen with farming practices so that they might do a better job of keeping the farmer "silo conscious".

Frank Hamlin, director, Molasses Silage Educational Committee, was scheduled to read a paper "Silage Grass Crops", but in his absence copies of his publication "How to Make Hay in the Rain" were distributed. This is an excellent illustrated booklet in color, which contains many helpful suggestions for silo salesmen.

The Association was fortunate in having present Dr. Glenn Frank, former president of the University of Wisconsin, to discuss business conditions in general.

Other papers were read concerning farming developments and trends of interest to silo manufacturers. The speakers were: F. B. Morrison, Chief of Animal Husbandry Div., Cornell University; Prof. F. W. Duffee, Chief Agricultural Engineering Department, University of Wisconsin; Prof. S. A. Witzel; and E. L. Brock, regional representative, and J. H. Wooton, manager of the Chicago field office, Federal Social Security Board, who discussed the handling of old age benefit and unemployment compensation accounts.

Sand-Lime Brick Production And Shipments

THE FOLLOWING DATA are compiled from reports received direct from producers of sand-lime brick located in various parts of the United States. They may be considered representative of the industry.

Eight active sand-lime brick plants reported for November and eleven for October, statistics for which were published in December.

Average Prices for November

Shipping Point	Plant Price	Delivered Price
Syracuse, N. Y.	12.00 C/L 14.00 L/C	16.00 C/L 20.00 L/C
Detroit, Mich.	——	16.00
Minneapolis, Minn.	9.50	——
Pontiac, Mich.	12.50	15.00
Saginaw, Mich.	10.90	——
Watertown, Mass.	——	10.50

Statistics for October and November

	Oct.†	Nov.*
Production	2,548,875	2,248,100
Shipments (rail)	942,450	912,095
Shipments (truck)	2,377,864	1,459,137
Stock on hand	2,067,732	2,209,362
Unfilled orders	3,090,000	2,152,000

†Eleven plants reporting; incomplete, five not reporting unfilled orders and four not reporting stock on hand.

*Eight plants reporting; incomplete, two not reporting unfilled orders and three not reporting stock on hand.

THE PARAGON PLASTER CO., Syracuse, N. Y., has received quite a good sized order to supply sand-lime bricks for use in sewer construction at Baldwinsville, N. Y.

WARNER CO., Philadelphia, Penn., removed its general offices from 1616 Walnut St. to 219 N. Broad St., Philadelphia, on November 27, 1937.

There Are Big Profits in CONCRETE PIPE

Millions of feet of concrete pipe are used for sewers, highway culverts and drains every year. With R & L CRESCENT equipment you can be sure of your share of this rapidly increasing market.

No experience necessary and only limited investment required to enter this profitable business. CRESCENT forms and equipment are precision-made and so easily operated that any common laborer can make the best possible concrete pipe with few simple instructions.

It will pay you to investigate. Write for complete details at once.

All-Steel Bell-end Form —Constructed of prime blue-annealed steel, and substantially reinforced with angle and bar steel, electric welded and riveted assures long life and uniform pipe.

R & L
CONCRETE MACHINERY CO.
KENDALLVILLE, INDIANA

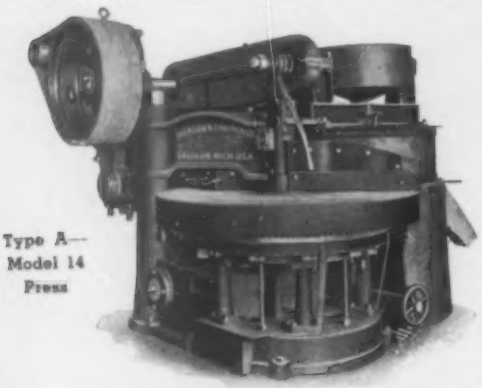
Be sure to see our display of pipe molds at the Concrete Industries Exposition in Chicago Feb. 8-11.

CORED STEEL PALLETS

Many Concrete Block Manufacturers have been enabled to meet highly competitive sales conditions through the use of COMMERCIAL CORED PALLETS. Not only have their costs of manufacture been materially reduced, but the quality of their products has been improved, as well.

COMMERCIAL CORED PALLETS are furnished in many different styles—a style to fit practically any machine and any type of block. Faster and smoother production, with less trouble, has been the experience of users of COMMERCIAL CORED PALLETS.

The COMMERCIAL SHEARING & STAMPING COMPANY
YOUNGSTOWN, OHIO.



Type A—
Model 14
Press

SAGINAW ROTARY SAND LIME BRICK PRESS

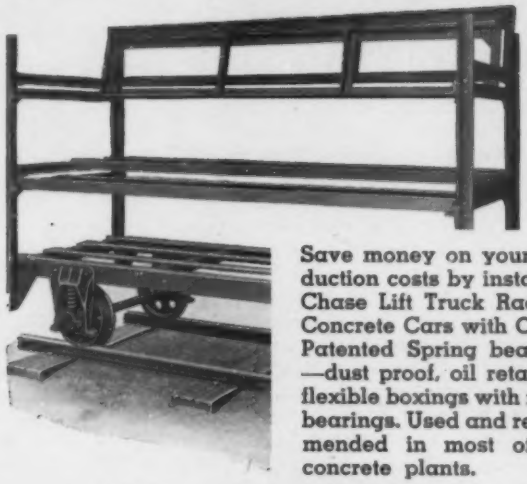
Many different types of presses have been tried out for making Sand-Lime Brick and the rotary table type of press has proven the most satisfactory in every way. Our press is the result of 30 years development and today stands by itself as the best and most economical for manufacturing Sand-Lime Brick.

The Type A Model 14 "Saginaw" Rotary Brick Press with a capacity of 3,000 to 3,400 brick per hour is a decided improvement over other models. All parts are designed to give the greatest amount of service and when worn out they may be readily replaced by accurately machined interchangeable parts. Special effort has been made to eliminate trouble for the user so that good brick may be made at lowest costs. One plant in the East has eight presses in use. Other presses have been changed from earlier models.

The era of direct motor drive has been met by a motor driven press and material hopper through texrope drive and a motor driven agitator. Push button controls are in instant reach of the operators without leaving their positions. The overload equipment of the motor control and the safety pin will instantly stop the machine and prevent damage if there is any chance of a jam any place in the operation.

JACKSON & CHURCH CO.
SAGINAW, MICHIGAN

LOW INITIAL COST
LOW MAINTENANCE COST



Save money on your production costs by installing Chase Lift Truck Rack or Concrete Cars with Chase Patented Spring bearings —dust proof, oil retaining flexible boxings with roller bearings. Used and recommended in most of the concrete plants.

WRITE
For Catalog and Special Low Prices

Complete line of concrete block cars, decks, Lift Truck Racks, transfer cars, turntables, dump cars, etc.

CHASE DRYER CARS & TRANSFER CARS
CHASE FOUNDRY & MFG. CO. COLUMBUS, OHIO

New Process Cements

CEMENT PROCESS CORPORATION, New York City, licensor of the Blank Process for making mortar cements by a special process described in various issues of ROCK PRODUCTS under the name of Plastocement, has licensed two Southern lime companies, which will start production about the first of 1938. An Eastern lime company will probably also be in production early in 1938. One of the large Middle West cement companies is arranging its plant to start production soon after the first of the year. It is stated that the patents have been extended considerably during 1937 which are said to cover the moist low heat field for the production of masonry, plastering, stuccoing and all-purpose cements.

New Building Material

KEASBEY & MATTISON CO., Ambler, Penn., has introduced a new building material for siding and partitions in industrial buildings. Known as Trafford tile, the new material is a composition of asbestos fiber and portland cement and is particularly suitable for application to large areas. Because of low initial cost, it is declared, substantial economies may be effected in the construction of skeleton frame buildings such as storehouses, lumber mills, power plants and exposition units. The tile is produced in standard lengths of from 3 to 8 ft. in areas of approximately 11 to 29 sq. ft. Accessories to be used with it, such as corner rolls, are supplied by the manufacturer as required.

Order Gravel Pit To Close

QUEEN ANNE SAND CO., Seattle, Wash., was ordered to cease operations at its pit, November 4, after a long dispute between residents of Queen Anne, adjacent to the pit. Residents claimed that the pool of water in the pit was a menace to the lives of children attending a school near the plant. The company had been operating under a temporary permit.

New Products

BELT LINE BRICK AND FLOORING CO., New Brighton, Minn., is manufacturing, in addition to sand-lime brick, hollow tile and glazed tile and marble type flooring.

TYGART LIMESTONE CO., Lawton, Ky., has purchased the Poplar Ballast Co., Carter, Ky., formerly operated by J. F. Lewis, owner.

Receivership Operation

SOUTHERN AGGREGATES, INC., Raleigh, N. C., will be operated under receivership by William Grissom, formerly of Raleigh, but more recently a resident of McLeansville, Guilford County.

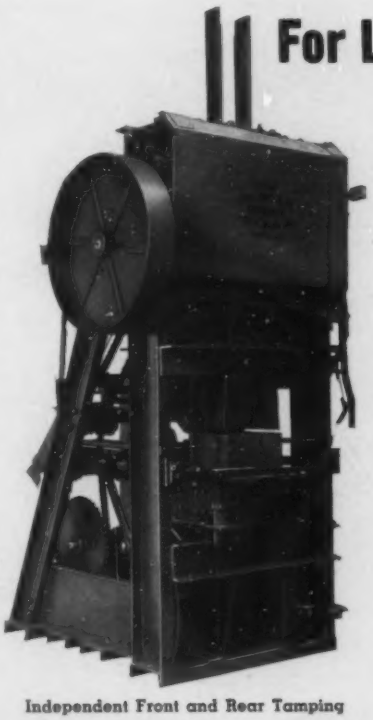
Housing Allotments

U. S. HOUSING AUTHORITY has made tentative allotments of federal funds for slum clearance in 25 cities to the amount of $105,300,000. Tentative allotments are as follows:

Pittsburgh, Penn.	$10,000,000
Bridgeport, Conn.	3,600,000
Syracuse, N. Y.	2,500,000
Jacksonville, Fla.	1,000,000
Columbus, Ohio	1,500,000
Detroit, Mich.	10,000,000
East St. Louis, Ill.	1,500,000
Annapolis, Md.	400,000
Birmingham, Ala.	4,500,000
Buffalo, N. Y.	4,900,000
Lowell, Mass.	2,700,000
Memphis, Tenn.	1,000,000
New Orleans, La.	7,200,000
Omaha, Neb.	2,100,000
Philadelphia, Penn.	12,000,000
St. Petersburg, Fla.	900,000
Yonkers, N. Y.	2,200,000
Youngstown, Ohio	3,600,000
Mobile, Ala.	1,400,000
Chicago, Ill.	16,000,000
Louisville, Ky.	4,000,000
Schenectady, N. Y.	1,400,000
Cleveland, Ohio	9,000,000
Scranton, Penn.	1,000,000
Charleston, S. C.	900,000

For Larger Profits in 1938 Use

MULTIPLEX
EQUIPMENT



Independent Front and Rear Tamping

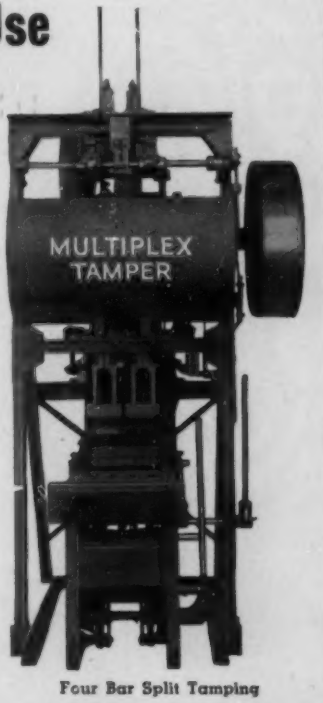
Machines ranging in capacity from 400 to 3000 units per day of the 8"x8"x16" size, and other sizes.

Check your requirements.

Hand Machines	Power Machines
Double Strippers	Power Presses
Single Strippers	Power Tampers
Tile Machines	Power Strippers
Flue Block Machines	Super-Tampers
Random-Ashlar Machines	Mixers
Brick Machines	Cars
Moulds, Forms	Racks

Complete plants installed.

See them at the
CONCRETE INDUSTRIES EXPOSITION
Chicago, Hotel Sherman, Feb. 8-11



Four Bar Split Tamping

MULTIPLEX CONCRETE MACHINERY COMPANY, ELMORE, OHIO

New MACHINERY & EQUIPMENT

Convertible Shovel, Crane or Dragline

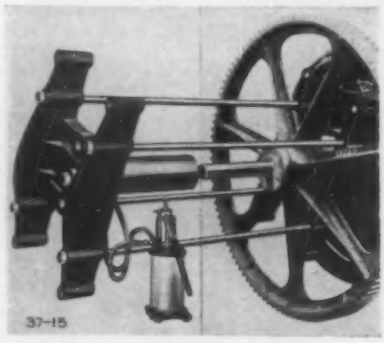
LIMA LOCOMOTIVE WORKS, INC., Lima, Ohio, announces the Lima Type 650, which is convertible into a shovel, crane or dragline. When used as a shovel it is equipped with a 1½-cu. yd. dipper, 21-ft. boom and 17-ft. dipper handle. The shovel boom is the box type design, electrically welded throughout, and the dipper handle is of the same modern construction. The Type 650 is available with either a gas, Diesel, oil or electric power unit. Only three levers and two foot pedals are necessary to control the three major operations, hoist, swing and crowd. Each major operation is independent of the other, which makes it possible to hoist, travel, swing and raise or lower the boom simultaneously. The drum laggings are split and are easily changed to fit any line speed. Helical cut gears are used throughout, and roller bearings are provided at every vital bearing point.

The crawler truck is composed of a one-piece base casting with four through axles on the ends of which revolve eight open-type, self-cleaning rollers. It is of the end drive principle with the drive chain located back under the crawler treads. Steering is accomplished with the upper frame at any position, which is an advantage when propelling in close quarters. The crawlers are so designed that they can be extended in length to increase the ground bearing area. The change from short crawlers to long crawlers can be made without dismantling the machine. The cab has an in-built winter front of shatter proof glass. More than one-half of the area of the cab can be opened to give ample ventilation in hot weather.

Three-purpose machine, convertible into a shovel, crane or dragline. When used as a shovel, it is equipped with a 1½-cu. yd. dipper, 21-ft. boom, and 17-ft. dipper handle

Hydraulic Press Facilitates Maintenance

BUCYRUS-ERIE CO., South Milwaukee, Wis., has developed a new portable hydraulic press which can be used either as a puller, press, or jack. The press



Portable hydraulic press which can be used either as a puller, press or jack

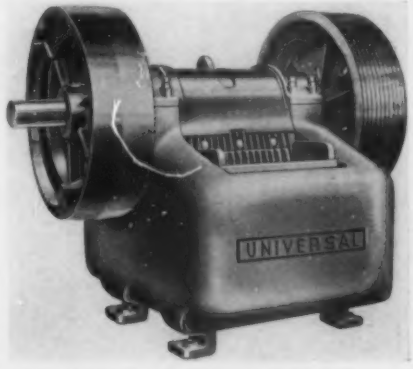
is made expressly for use on heavy machinery to press large gears on shafts, pull bevel pinions, pull drum shaft gears; for press work on shovel gears, spiders, sprockets, swing shaft assembly, crowd shaft assembly, shipper shaft, and track mechanism. In addition it is adaptable for use as a jack up to a capacity of 150 tons. As a jack the compact press cylinder (ram), weighing only 75 lb. is used to lift, and can be set up in any position.

The new portable press includes a frame for press work, a four-speed pump, a press cylinder or ram having a pressure capacity up to 150 tons, four alloy steel frame rods, a back plate, and high-pressure hose and valve connections. Special equipment available includes sprocket lugs, frame extension rods, connectors for extension rods, extra long high-pressure hose, angle iron stand for frame, and frame for track repair work.

Reduce Weight in New Jaw Crusher

UNIVERSAL CRUSHER CO., Cedar Rapids, Iowa, announces what is said to be the first major design change since the inception of jaw crushers.

This new crushing unit, the manufacturer claims, possesses unusual



Jaw crusher has streamlined frame

strength from the streamlined frame, plus weight savings that approximate 20 percent over conventional types of crushers.

By reason of greater strength and lightness, savings are effected in first cost, in shipping costs, in installation and operating costs. An illustration of the new 10- x 16-in. crusher is shown herewith.

Special Alloy for Pump Liner Plates

PETTIBONE MULLIKEN CORP., Chicago, Ill., developed in its laboratories approximately three years ago a new metal, known as Diamond alloy. It was originally developed to be used in pumps

handling sand in suspension in the water.

The particular pumps for which the metal was developed were required to handle sand in water which contained a percentage of acid. Other hard alloys were just as hard as Diamond alloy, but it was found that the acid in the water had a corroding effect that was almost as serious as the abrasive effect of the sand.

At Ft. Peck, Montana, the U. S. Engineer used Diamond alloy on the liner plates of the 28 in. dredge pumps. Diamond alloy liner plates have had an important part in moving as much as eight million cubic yards to date and are still in operation. This new alloy has a Brinnell hardness of 550 to 600, and a tensile strength of from 60,000 to 80,000 lbs. p.s.i

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Progress In Electric Welding

By C. M. TAYLOR,

Vice Pres., The Lincoln Electric Co., Cleveland, Ohio

ELECTRIC ARC WELDING is not new to operators of rock products plants. This process has long been used effectively and economically in the maintenance of machinery in this industry. So familiar are these producers with electric welding as a maintenance tool, that they probably look upon the electric arc only in this light, not being aware that electric welding is coming into increasing use as a manufacturing process for the production of equipment.

Simplicity of electric welding is its outstanding feature when it comes to the manufacture of any product. With electric welding, the various component parts of a product are cut from standard mill shapes and plates, arranged in the proper relation, and then fused together into a single piece of steel. As no intermediate connecting members are needed, designing and detailing are therefore greatly simplified and production time is materially lessened. The result is a reduction in manufacturing cost.

While the savings available through arc welding in manufacturing are largely responsible for the growing adoption of the process, they naturally are not the sole reason. While it does lower production costs, the process actually makes it possible to produce better products. Steel makes the products stronger, more rigid, more resistant to fatigue, shock and impact. Stronger construction means greater capacity. Higher resistance to fatigue, shock and impact means increased service life. Arc welded steel is as high in physical properties where welded as anywhere else. Welds made today by the modern shielded arc process equal mild rolled steel in tensile strength, ductility, density and resistance to fatigue and impact.

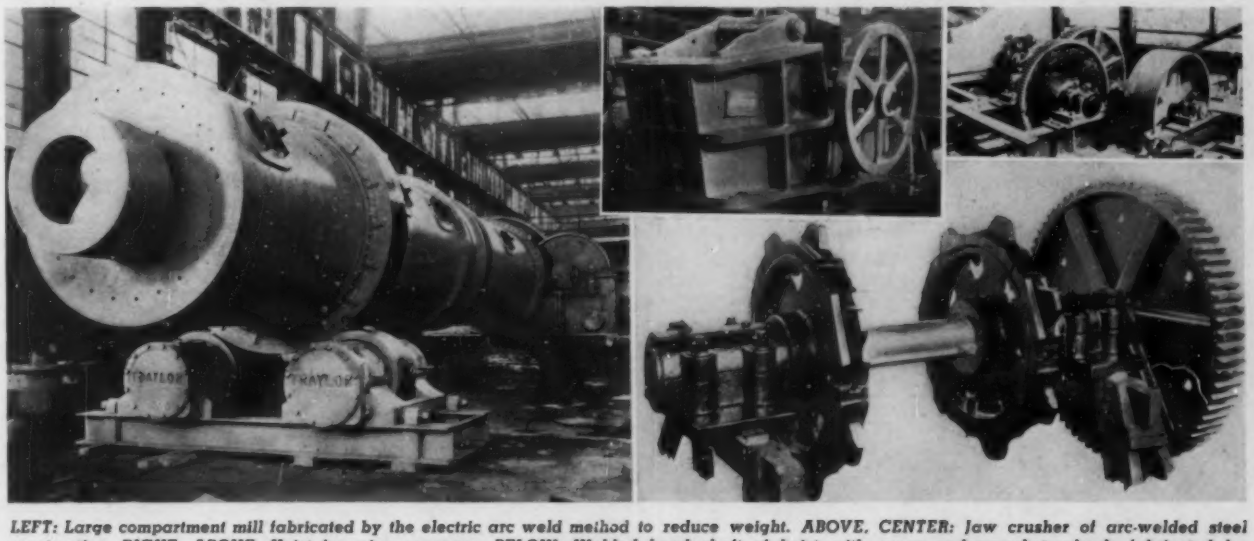
Welding Applications

Several examples of the simple manner in which products are built by electric welding are shown in the illustrations. An interesting application of electric welding is shown in the illustration of sprocket wheels, having "demountable" teeth. The equipment shown is a welded head shaft with gears and sprockets for a run-of-mine coal conveyor. These sprocket wheels are entirely fabricated by electric welding as is also the large gear.

In another illustration is a large jaw crusher made of arc welded steel. The manufacturer of this equipment reports a reduction of 50 percent in the weight of the frame. This jaw crusher also typifies the characteristic simplicity of arc welded construction. While the crusher may appear complicated at first glance, on closer inspection it is seen that the construction consists simply of joining together a number of pieces of steel which have been cut to the required size and shape.

The habit of looking upon any machine, product or structure, as simply an assembly of relatively simple parts has removed a lot of the so-called "mystery" of arc welded design. Formerly, engineers and designers were somewhat handicapped by a feeling that designing for arc welded construction was highly complicated. That this opinion has changed considerably is evidenced by the steel compartment mill, fabricated entirely of arc welded steel, which is seen in one of the illustrations. While it is certainly complicated looking, it is essentially made by the same "step-at-a-time" manufacturing method. The various component parts consist of elements cut from standard steel shapes and plates, fused together by the electric arc. The compartment mill illustrated is said to be 10 percent lighter in weight and considerably less expensive to build than by the former method.

What is believed to be the world's longest rotary lime kiln was made of all-welded steel construction. It is 400 ft. in length, consisting of a 300 ft. zone, a 10 ft. tapered zone, and a 90 ft. preheating zone. The diameter of the pipe through the 300 ft. zone is 8 ft. 6 in. and 7 ft. through the preheating zone. The kiln has a capacity of 200 tons of lime per day. The huge kiln is fabricated of ⅞-in. steel plate throughout except under the tires where the thickness is 1 in. There are a total of 21 arc welded sections in the kiln.



LEFT: Large compartment mill fabricated by the electric arc weld method to reduce weight. ABOVE, CENTER: Jaw crusher of arc-welded steel construction. RIGHT, ABOVE: Hoist for mine conveyor. BELOW: Welded head shaft of hoist with gears and sprocket wheels fabricated by electric welding

New Portland Cement Plant

(Continued from page 89)

"to engage the services of the most well qualified experts money can hire. This holds true from the lowest to the most high ranking employee.

"Thomas B. Douglas, our technical engineer, is a graduate of the Virginia Military Institute and was formerly technical engineer for Dewey Portland Cement Co., Kansas City.

"Mr. Douglas is probably best known as the developer of a well-known masonry cement. He also assisted in developing a formula for an early strength cement. He will be directly responsible for specifications and technical control of cement production of our new plant.

"As our chief chemist we have engaged the services of Geoff A. Saeger, who comes to us from Washington, D. C., where he has been one of the chief chemists for the cement section of the Bureau of Standards."

Construction work is under supervision of the Burrell Engineering Co. The Austin Bridge Co., a Texas firm, are general contractors. Some of the local firms supplying material are Mosher Steel Co., Wyatt Metal Boiler Works, Horton and Horton, Temple Lumber Co., South Texas Lumber Co., W. L. Macatee & Sons, Inc., Gulf Concrete Pipe Co., Producers Supply & Tool Co., and Kuhn Paint Co. Dowdell, Lockewood and Andrews, of Houston, are the electrical engineers.

Ownership Change

RAY HOOTON, Greenville, Ind., has purchased the gravel pit of T. B. Leary on State road 234, southeast of Eden, Ind. Extensive improvements will be made. Concrete products, sand, gravel and ready-mixed concrete will be produced.

Expansion

OHIO ROCK ASPHALT CORP., Hillsboro, Ohio, will expend $50,000 on improvements and new equipment according to H. S. Jones, superintendent. Included in the new equipment is a 150-hp. Diesel motor and a pug mill.

NATIONAL GYPSUM CO., Buffalo, N. Y., is building a $2,000,000 plant at Mobile, Ala., announced originally as a fibre board manufacturing plant. It is now stated that the plant will later include facilities for manufacture of gypsum products.

Fire

C. C. BEAM, INC., Melvin, Ohio, suffered the loss of its asphalt and crushed stone mixing plant by explosion and fire on December 3. It is reported that an explosion occurred in the mixing bowl of the plant and subsequent fire destroyed the housing and damaged several thousand dollars worth of equipment. The company will re-model and re-build immediately.

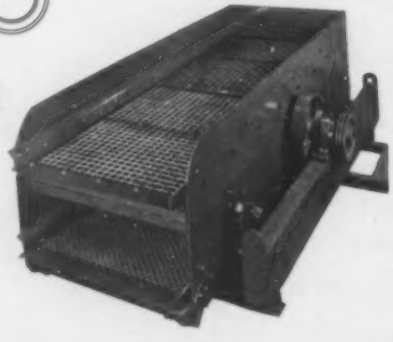
KENTUCKY CONCRETE PIPE CO., 32nd and Woodland St., Louisville, Ky., plant was destroyed by fire December 7, with a loss estimated at $35,000. It is believed that the fire started from the boiler. C. G. Woody is superintendent. It is expected that the plant will be rebuilt immediately.

M. KAMMERER & SONS CONCRETE PRODUCTS CO., El Paso, Ill., was destroyed by fire December 9, with a loss estimated at $50,000. The fire originated in the boiler room. The plant was built in 1922, and it is announced by M. Kammerer, head of the company, that it would be rebuilt immediately.

BERT STRICKLER, York, Penn., concrete block factory was partially damaged by fire November 20. The damage was estimated at $2,000 and was partially covered by insurance. Rebuilding will start soon.

SECO

A NEW AND BETTER VIBRATING SCREEN



POSITIVE CONTROLLED CIRCULAR MOTION UNDER ALL CONDITIONS OF LOAD AND SPEED

Designed And Built By An Organization Experienced And Specializing In Effective Screening Methods.

See Our Exhibit At Both Conventions At Cincinnati

SCREEN EQUIPMENT CO. BUFFALO, N. Y.

BACON FARREL CRUSHERS

Complete Plants Designed and Equipped. Screens, Elevators, Conveyors, Quarry, Sand and Gravel Plant Equipment. Engineering Service.

EARLE C. BACON, Inc.
17 John Street New York, N. Y.

To Start Production

THE CHAMBERLIN CO., LOS ANGELES. Calif., has leased "Pumice island" and has rebuilt the mill preparatory to beginning operation. The pumice is to be shipped by truck to the company's plant in Los Angeles for grinding and marketing. Conveyors will dump the pumice and earth into water where the light pumice is floated out. It will then be washed with a pressure spray, dried in a kiln and placed into bins. "Pumice island" was operated by the government during the war.

Dust Problem

THE W. W. SLY MANUFACTURING CO., Cleveland, Ohio, announces the publication of a series of booklets which describe the hazards involved in various concentrations of dust in manufacturing operations and the methods which may be adopted to effectively control and largely eliminate dangerous and wasteful suspension of dust in the atmosphere.

Strange Theft

MERKEL GRAVEL CO., Hamilton, O., recently reported the theft of an aluminum flood light and copper wire valued at $100.

New Power

CHARLES ENGLAND GRAVEL CO., Plainville, Ind., is installing an 85-100-hp. Cummings Diesel engine on a dredge to operate a 6-in. Amsco pump, through a reduction gear, which will drive the pump at 450 r.p.m. with 1000 r.p.m. engine speed.

D. G. HILL & CO., Council Bluff, Mo., is installing a Fairbanks-Morse Diesel engine electric unit at the plant of the former Energy Gravel Co.

LUTESVILLE SAND & GRAVEL CO., Colfax, La., is installing a Buckeye 300-hp. Diesel engine to furnish all of the plant's power requirements.

Ready Mix

MISSISSIPPI MATERIALS CO., Jackson, Miss., has a modern central concrete mixing plant, and fleet of agitator mixer trucks to deliver ready-mixed concrete. This company has been very active this summer in furnishing concrete for a number of large building construction jobs.

CHARLES WESLEY, Great Bend, Kan., has gone into the ready-mixed concrete business with the purchase of a new 2-ton International truck on which a transit-type mixer has been mounted. A location has not been decided upon.

Dependable
LESCHEN
WIRE ROPE
Made of Acid Open-Hearth Steel Wire
"HERCULES" RED-STRAND WIRE ROPE
A CORRECT ROPE FOR EVERY PURPOSE—IN BOTH QUALITY AND CONSTRUCTION
There is no guesswork when you use "HERCULES" (Red Strand) Wire Rope. It is designed and built to do specific jobs better... safer... more economical—not just rope made to sell. Furnished in a wide variety of constructions for different uses—each backed by 81 years of manufacturing experience and close cooperation with users. You can depend on "HERCULES" for safe and economical performance.
PREFORMED: If a preformed wire rope is best for your conditions, you will find "Leschen Preformed" to be the most efficient in this type.
A. LESCHEN & SONS ROPE CO.
Manufacturers • • • Established 1857
5909 KENNERLY AVENUE • ST. LOUIS, MO.
NEW YORK
CHICAGO
DENVER
SAN FRANCISCO
PORTLAND
SEATTLE

Offers Property

QUEEN ANNE SAND & GRAVEL CO., Seattle, Wash., has offered its property to the city for $16,000. The city is said to be anxious to acquire the property in order to eliminate a dangerous water hole which school children must pass on their way to school. The company was prohibited from further working of the pit by a recent order of the city board of public safety.

Enterprise

EDGAR BAKER AND ASSOCIATES, Batesville, Ark., it is reported locally, will start construction of a new lime plant near Guion, Ark., within a short time on the property leased from the St. Clair Marble Co. It is said construction of this plant was encouraged by the building of new paper mills in the southern part of the state.

Rock Wool Plant

VERDIGRIS VALLEY VITRIFIED BRICK CO., Neodesha, Kan., has completed construction of a new rock wool plant, using shale and limestone as raw materials, and a gas-fired reverberatory furnace of two tons capacity of raw material per charge. Charles Laird is superintendent.

Fatal Accident

MEDUSA PORTLAND CEMENT CO., Wampum, Pa., plant suffered a fatal blasting accident on November 26, in which one man was killed and another seriously injured.

Why DIXIE HAMMERMILLS Excel

DIXIE Non-Clog HAMMERMILLS are exceptionally powerful and dependable units for crushing cement rock, limestone, slate, gypsum, lime, clay, asphalt, coal, marl, etc.

Note the simple, sturdy swing hammer construction and the specially designed, continually moving breaker plate. This Non-Clog Breaker plate is an exclusive DIXIE feature and will positively prevent all troubles and loss of time from clogging.

Our complete line of DIXIE STANDARD MOGUL HAMMERMILLS are similar in construction to the NON-CLOG type but are equipped with stationary breaker plates.

From our line of 40 sizes you will find a DIXIE to meet your every need.

Write for further details.

DIXIE MACHINERY MFG. CO.

4109 GOODFELLOW AVE. . . . . ST. LOUIS, MO.

Enterprise

ERIE STONE Co., Indianapolis, Ind., is opening a new quarry at Wabash, Ind., using equipment moved from its Kokomo, Ind., plant. The new plant will have an approximate capacity of 60,000 tons yearly.

●

MEDUSA PORTLAND CEMENT Co., Cleveland, Ohio, is reported planning a new distributing plant at Paris, Ont., to cost, with equipment, approximately $175,000.

●

MICHIGAN LIMESTONE & CHEMICAL Co., Buffalo, N. Y., pulverized limestone plant, is building an addition to cost approximately $30,000 with equipment.

●

PITTSBURGH MIDWAY Co., Baxter Springs, Kan., has recently completed a new plant for processing tripoli, largely equipped by the Allis-Chalmers Manufacturing Co.

●

WESTEX MATERIALS Co., Big Spring, Tex., J. P. McMahon, owner and operator, has established a new plant seven miles southeast of Big Spring to supply washed and crushed gravel and sand for highway construction.

●

WATSON SAND & GRAVEL Co., Fluker, La., completed a new plant November 1 for dredging, washing and screening sand and gravel, at an approximate cost of $42,000.

Plants Down

UNIVERSAL ATLAS CEMENT Co., Hannibal, Mo., plant, ceased production December 1 until probably early in January. Shipments from stock will continue.

●

WASHINGTON - IDAHO LIME PRODUCTS Co., Orofino, Idaho, ceased operation on November 19 of all departments of its cement plants with the exception of finish grinding.

●

UNITED STATES GYPSUM Co., Evans, Wash., lime plant temporarily suspended manufacturing operations December 1st for an indefinite period, according to local reports.

●

WOLVERINE PORTLAND CEMENT Co., Quincy, Mich., plant ceased production November 29 until approximately April 15. Shipments from stock continue.

●

UNIVERSAL ATLAS CEMENT Co., Waco, Tex., plant was host on November 25 to its colored employes.

●

NORTH AMERICAN CEMENT CORPORATION suspended production late in November until about April 1. Shipments will continue to be made from stock.

Road Show Will Have Over 400 Exhibits

Plans are now being completed for the 35th Annual Convention and Road Show of the American Road Builders' Association to be held in the huge public auditorium in Cleveland, Ohio, January 17 to 22, inclusive. The United States Bureau of Public Roads will have an exhibit on soil stabilization, and the manufacturers will display the latest developments in equipment. The following companies have announced details regarding the equipment which will be exhibited:

American Manganese Steel, Chicago Heights, Ill., division of The American Brake Shoe & Foundry Co., plans to exhibit a model of their two-piece body renewable lip dipper, arranged so that it can be taken apart to demonstrate the construction. The exhibit will also include repointer bars for rebuilding worn dipper teeth and welding rods for reclamation work. Representatives who are expected to attend the show include: W. M. Black, W. A. Henderson, W. J. Mullally, T. A. Ratkowski, J. A. Brandenburg, and H. W. Hurst.

Lima Locomotive Works, Inc., Shovel and Crane division, Lima, Ohio, will exhibit a type 1001 shovel equipped with a 26-ft. boom, 18-ft. dipper handle, and a 2½-cu. yd. dipper. It will be powered with a Waukesha-Hesselman oil engine. The following members of the organization will attend the show: Henry Barnhart, general sales manager; J. E. Mereness, central district manager; J. W. Fawcett, eastern district manager; A. E. Meinecke, Twin City district manager; G. L. Lillard, southern district manager; H. E. Lowe, southern pacific district manager; W. C. Champion, pacific northwest district manager; T. J. Hawthorne, southwestern district manager; and Roy Wills, advertising manager.

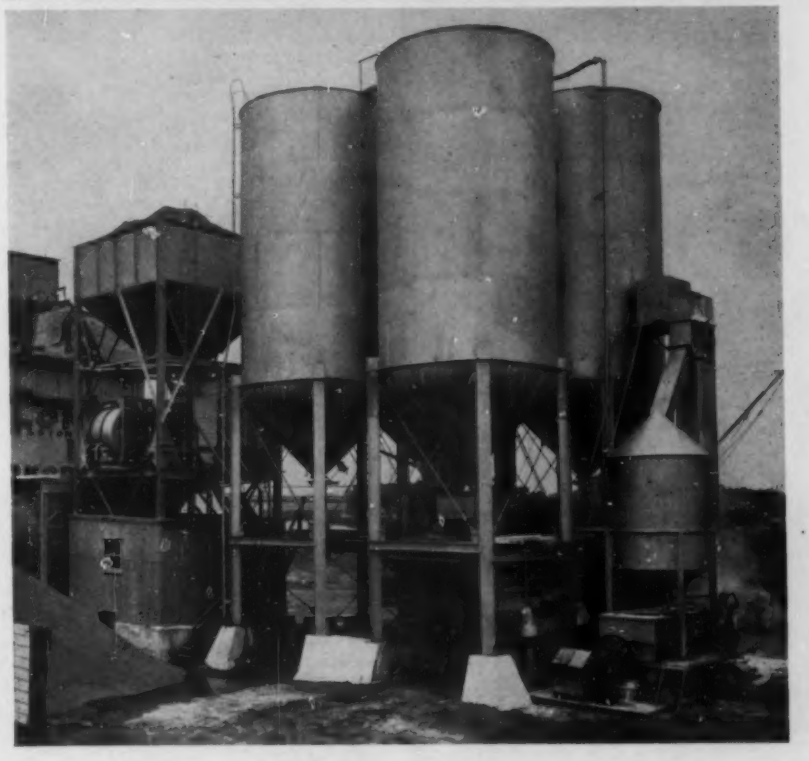
Link-Belt Co., Chicago, Ill., will occupy booth A-10. A "Speed-o-Matic" hydraulic-control shovel, model K-48, with the new streamline cab, will be a feature of this company's exhibit. It will be made accessible for inspection by a stairway leading to the cab floor, and a platform will extend around one side and the back. An operating unit of the new control also will be on display. Representatives who plan to attend are: From Chicago, Alfred Kauffmann, president; E. J. Burnell, vice-president; E. L. Berry, assistant general manager; N. L. Davis, general sales manager; G. H. Olson, general manager, shovel division; L. P. Spillan, sales manager, shovel division; N. A. Weston, J. C. Bloomfield, D. M. Pfau, H. N. Ekbom; J. S. Holl, advertising manager, A. H. Boike, A. H. Sampson, advertising department; from New York, C. S. Lewis and Lestern Coonley; from Philadelphia, E. F. Carey and B. H. MacNeal.

Owen Bucket Co., Cleveland, Ohio, will show three new products; a combination orange peel bucket and grapple, a new light material handling bucket, a new heavy round nose bucket. There will also be a model of the orange peel and models of rock grapples in operation. Representatives of the company in attendance will be: H. W. Botten, general manager; E. W. Botten, sales manager; W. S. Jenkins, chief engineer; W. H. Russell, Cleveland district manager; P. T. Robin, New York district manager; G. A. Whitehead, Philadelphia district manager; and L. L. Hanson, Chicago district manager.

The T. L. Smith Co., Milwaukee, Wis., will show three concrete mixers which have never been previously exhibited, two of which are said to be of revolutionary design.

Smith Engineering Works, Milwaukee, Wis., will have an exhibit in booth D-41. This exhibit will consist of a model crushing plant; an operating model which will crush rock. It will be equipped with a Telsmith-Wheeling jaw crusher, a Telsmith Gyrasphere, and a Telsmith Pulsator, complete with power equipment, conveyors, bins and necessary drives. Although built to small scale, all equipment will accurately duplicate designs of equipment in service.

The BROOKS-TAYLOR Lime Putty Plant



... in NEW YORK

The Colonial Sand & Stone Company distributes lime putty-sanded brick mortar throughout the New York metropolitan district from the Brooks-Taylor lime putty plant illustrated above at Astoria. It has sufficient capacity to produce 600 cu. yds. of mortar daily.

The Brooks-Taylor process is surprisingly low in cost considering the volume of business it is capable of developing. By dealing largely with present customers, little extra bookkeeping, billing or overhead expense is necessary. Present equipment can even be used for deliveries—until the increased business requires the purchase of additional trucks.

A Brooks-Taylor lime putty plant is a complete unit for producing and handling aged lime putty. The dry lime is elevated to a storage bin, slaked mechanically and pumped into the ageing tanks where excess water is removed by means of special filters. The finished putty is withdrawn from the ageing tanks as required for delivery. Portland cement is added to the putty and sand mixture on the job.

Write our nearest office for further information on the Brooks-Taylor process or equipment. Standard plants are built with two or more ageing tanks, depending upon the capacity required.

CHICAGO BRIDGE & IRON COMPANY

Plants at BIRMINGHAM, CHICAGO and GREENVILLE, PA.

Chicago..2452 Old Colony Bldg.
New York...3396-165 Broadway
Cleveland.2265 Rockefeller Bldg.
Detroit....1553 LaFayette Bldg.
Dallas..1487 Liberty Bank Bldg.
Birmingham..1505 N. 50th Street
Tulsa.....1650 Hunt Bldg.
Houston.....2919 Main Street
Philadelphia.1651-1700 Walnut St.
Boston...1564 Consol. Gas Bldg.
San Francisco..1093 Rialto Bldg.
Los Angeles..1458 Wm. Fox Bldg.

"I'm Not In Business For My Health!"

..."Certainly I'm a UNIVERSAL user! . . . economy, efficiency and speed are all-important factors in separating our materials. No frills or gadgets for us . . . we're interested only in a low cost machine that will handle our separations with speed and precision!"

* LOW MAINTENANCE COSTS
* ACCURATE SEPARATIONS
* MAXIMUM CAPACITY
* NO BLINDING

The biggest value in Vibrating Screens — Priced at $296 and up.

Write today for complete catalog.

UNIVERSAL VIBRATING SCREEN CO.
RACINE — — WISCONSIN

SCHAFFER
POIDOMETERS

GUARD PROFITS

These efficient, accurate, economical weighing and feeding machines have proven their value to operators of cement mills, for accurately proportioning stone and clay—also clinker and gypsum by weight and not by volume.

Also being used for weighing and feeding material to all types of Grinding Mills.

The Poidometer is self-contained. The scale beam is graduated in pounds or kilos, and can be set at whatever amount of material may be required per foot of belt travel; the gate is then adjusted to suit this weight, and the machine will deliver the pre-determined amount of material with an accuracy of ninety-nine per cent.

Write for Catalog No. 2 and get complete profit-producing facts!

Schaffer Poidometer Co.
2828 Smallman St., PITTSBURGH, PA.

The Thew Shovel Co., Lorain, Ohio, will exhibit, among other new improvements and developments in excavating equipment, the new shovel boom for use on the 1½-cu. yd. Lorain 77 and the 1¼-cu. yd. Lorain 75-D. The boom is said to be virtually two booms in one, a structural member which absorbs all bending and compression stresses, and the other, a torsional member which absorbs and resists all boom twisting stresses.

Wellman Engineering Co., Cleveland, Ohio, will have on display clamshell buckets of both the power arm and multiple-rope types; also the Williams dragline bucket.

Bethlehem Steel Co., Bethlehem, Penn., will display a new road joint, two 16-ft. highway cable guards, hollow drill steel jack rods for detachable bits, and operating models of machinery used in the manufacture of wire rope.

Koehring Co., Milwaukee, Wis., will exhibit the dual drum 34-E paver, the 303 and 603 excavator models, the Dumptor and Trail-Dump, and various sizes of concrete mixers.

The Blaw-Knox Co., Pittsburgh, Penn., will have on display at its booth: batcher plants, weighing batchers, bulk cement plants, Trukmixers and agitators, clamshell buckets, and concrete buckets.

The Chain Belt Co., Milwaukee, Wis., will demonstrate the new Rex 34-E dual drum paver, the 160 Rex Pumpcrete, the 2-cu. yd. Rex Moto-Mixer mounted on a truck, and the 10 M Rex speed prime pump.

Bay City Shovels, Inc., Bay City, Mich., will show the Model 25 ½-cu. yd. shovel, the Model 45 heavy duty, ¾-cu. yd. full revolving machine, the ½-cu. yd. dragline bucket, and the Model 32 ⅜-cu. yd. full revolving shovel.

The Gardner-Denver Co., Quincy, Ill., will exhibit the new Utility 85-ft. portable air compressor.

Worthington Pump and Machinery Corp., Harrison, N. J., will display in Booth D-43 the Model 315 Diesel engine driven air compressor, the new Model 105 gasoline driven air compressor, and the latest models and designs of rock drills, including a new type No. 24 rock hammer, a No. 19 clay spade, and a No. 16 trench digger. C. T. Oechsle will be in charge.

The Butler Bin Co., Waukesha, Wis., will exhibit two different types of bulk cement handling plants; the conventional bin type with weighing batcher and undertrack screw having bucket elevator for unloading cement from hopper-bottom cars, and a new design of plant for locations where cement must be shipped in box cars.

R. G. Le Tourneau, Inc., Peoria, Ill., will have on display one of its heavy duty rooters, power control units, and a new type collapsible bucket scraper.

Austin-Western Road Machinery Co., Aurora, Ill., will show for the first time its new "99" motor grader.

Ingersoll-Rand Co., Phillipsburg, N. J., has planned an extensive exhibit of over 100 items, covering its complete line of portable air compressors, rock drills, and pneumatic tools. The exhibit will be found at Booth E-36. Those in attendance will be: W. J. Brennan, Cleveland; T. L. Clark, New York; Stacy H. Hill, Chicago; R. G. Kaminski, Buffalo; R. D. Kellegrew, Boston; J. J. Kennedy, Washington; L. D. Knight, Los Angeles; G. J. Mehr, Philadelphia; P. F. Minister, Chicago; J. R. Randle, St. Louis; C. H. Sellars, New York; M. W. Thomassen, Chicago; G. C. Williams, New York; R. C. Beyer, Dallas; and W. G. Lofgren, Los Angeles.

S K F Industries, Inc., Philadelphia, Penn., will have an exhibit in space E-53 in which a complete line of ball and roller bearings and pillow blocks will be displayed. Representatives who will attend include: R. H. De Mott, R. C. Byler, G. Palmgren, P. R. Payson, C. B. Knowles, Otto Neumer, J. B. Castino, and R. R. Zizette.

Pioneer Gravel Equipment Mfg. Co., Minneapolis, Minn., will feature stabilized roads in an exhibit in Booth B-2. A model horizontal gradation screen with belt conveyor and mechanical feeder will be in operation. There will also be a model jaw crusher on display. Both models will be one-fourth actual size. Officials in attendance will include: K. E. Brunsdale, sales manager; M. Ovestrud, vice-president; C. K. Ordway and Carl R. Rolf, district sales managers.

Athey Truss Wheel Co., Chicago, Ill., will show the latest developments in tracklaying wheel hauling units in conjunction with the Caterpillar exhibit. The new equipment featured will be the 16-cu. yd. bottom dump trailer and the 16-cu. yd., two-way dump trailer.

Broderick & Bascom Rope Co., St. Louis, Mo., will display in Booth E-5, wire rope of all kinds, emphasizing particularly Yellow Strand grade and Fex-Set Preformed construction. Fred Zimmerman, sales manager, will be in charge of the exhibit. Other representatives will include D. E. Dickey, J. J. Sieber, Mr. Patterson, and Mr. Graubner.

The Calcium Chloride Association has laid plans for a comprehensive exhibit of calcium chloride in its various applications to highway use. An illuminated photographic display will dramatize the year-round use of calcium chloride—in stabilization, dustless maintenance, concrete curing and ice control. The association will have exhibit space, D-8 in the North Exhibit Hall. Ray Giddings, Fred Burggraf, Charlie Tiney and Bob Fosburg will represent the Association.

Marion Steam Shovel Co., Marion, Ohio, will exhibit a new ¾-cu. yd. excavator, in Space A-22.

Sauerman Bros., Inc., Chicago, Ill., will arrange their booth (Space D-39) entirely for the comfort of visitors. Booklets will be distributed giving information on the many uses of Sauerman drag scraper and slackline machines and scraper buckets in excavating and handling materials, but no actual machinery will be displayed. Members of the Sauerman organization in attendance will be D. D. Guilfoil, G. H. Tompkins, L. E. Dierks.

Diamond Iron Works, Inc., Minneapolis, Minn., plans to display, at Booth B-34, a roller bearing jaw crusher, a roller bearing roll crusher, a vibrating screen, and various equipment parts. Representatives will include: President, L. J. Reay; vice-president, W. G. Barstow; sales manager, O. E. Ertle; chief engineer, C. F. Olmstead; C. T. Johnson, W. R. Furr, C. Knowles, and H. F. Stenstrom.

Sullivan Machinery Co., Michigan City, Ind., will have an exhibit of which will include plus portable air compressors, rock drills, busters, detachable bits, pneumatic feed drills, and drill mountings. The exhibit will be at Booth B-25.

The Hug Co., Highland, Ill., announces that its exhibit will include a new Hug Lugger, Model 16, equipped with a new automotive type Caterpillar Diesel engine, the first of the new automotive type design series built by the Caterpillar Tractor Co. A newly designed Model 87Q Hug Roadbuilder, built with a 6-cu. yd. scoop end body and new "armored" front end, also will be displayed.

Continental Roll & Steel Foundry Co., East Chicago, Ind., will show wagon scrapers, including the 4, 5, 7 and 10-cu. yd. sizes mounted on pneumatic-tired wheels and 5, 7 and 10-cu. yd. sizes mounted on crawlers. Those attending are G. B. Wadlow, J. E. White, W. J. Adams, W. S. Stuart, R. Kerrick, Duke Kerrick and A. N. Moran.

Davey Compressor Co., Inc., Kent, Ohio, will display a new 315-ft. side by side compressor, portable type, which has a short turning radius.

The Eagle Crusher Co., Inc., Galion, Ohio, will display a 10x20-in. crusher with plain or anti-friction bearings, and also smaller roadside crushers.

THE INDUSTRY

New Incorporations

Artcraft Asbestos Corp., New York, N. Y., has been incorporated by Jerome Parker, 2 Lafayette St., New York City, to deal in asbestos, minerals, and felt. Capital stock comprises 200 shares of no par value.

Asbestos Cement & Fiber Corp., 517 W. 45th St., New York, N. Y., a company manufacturing asbestos, has been assigned to Levin H. Arnett, 4309 47th Ave., Queens, L. I., N. Y.

County Sand & Gravel Co., Trinity, Tex., has been incorporated with a capital stock of $5,000. Articles of incorporation state that the company will be engaged in mining and manufacturing. The incorporators are H. W. Anderson, G. Marie Anderson, and R. J. Mac Bean.

Elam Sand & Gravel Corp., Rochester, N. Y., is the name of a new company which will engage in sand and gravel business. The new enterprise has issued 200 shares of no par value stock. Incorporation papers were filed by William B. Gelb, 111 Wilder Building, Rochester, N. Y.

Salisbury Concrete Products Corp., Salisbury, Md., is the name of a new company organized to manufacture concrete block and cinder concrete brick. The incorporators are Ralph R. Gordy, Lewis J. McBriety and William W. Travers. Capital stock comprises 50 shares at $100 par value.

Valley Rock and Sand Co., Bakersfield, Calif., has filed articles of incorporation, authorizing capital of $200,000.

Manufacturers

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has opened a regular office in Syracuse, N. Y., with George H. Carden as sales engineer in charge. This office will operate as a branch of the company's Buffalo district office of which H. E. Weiss is manager.

Worthington Pump and Machinery Corp., Harrison, N. J., has announced the appointment of W. E. Wechter as manager of oil and gas engine sales, Atlantic division. Mr. Wechter succeeds R. L. Howes, recently resigned.

Federal Motor Truck Co., Detroit, Mich., reports the appointment of K. M. Schaefer as assistant to the general manager, assigned to sales. Mr. Schaefer will collaborate with R. W. Ruddon, vice president and general manager, in planning a sales program.

Ralph B. Holcomb

Harnischfeger Corporation, Milwaukee, Wis., reports that Ralph B. Holcomb has been placed in the position of district sales manager of the Memphis territory. Mr. Holcomb had been for some time previously connected with the sales force of the company in the capacity of sales engineer. He started in the Kansas City territory, later was transferred to New York, and then to Philadelphia.

Waukesha Motor Co., Waukesha, Wis., has appointed F. C. Schulze to the position of assistant sales manager. Mr. Schulze became associated with Waukesha in 1928, after having graduated from Carroll College, Waukesha, Wis.

O. C. Keckley Co., Chicago, announces the appointment of L. W. Browne, formerly president of the Fisher Governor Co., as vice president in charge of sales and distribution of their steam and liquid control equipment.

Robins Conveying Belt Co., New York, N. Y., reports that A. A. Nelson has joined the sales forces of the company, covering a territory which comprises the eastern end of New York state and the western part of Connecticut. Mr. Nelson is an engineer of long experience in the material handling machinery industry and has an intimate knowledge of field problems.

American Hoist & Derrick Co., St. Paul, Minn., has appointed Stanley M. Hunter manager of sales. Mr. Hunter has been associated with the company for the last two years.

The Falk Corp., Milwaukee, Wis., has announced the appointment of The Transmission Engineering Co., 116 New Montgomery St., San Francisco, as its representative in Northern California. Mr. A. Pedersen will be in charge of this office.

Caterpillar Tractor Co., Peoria, Ill., has made five changes in its organization, according to President B. C. Heacock. A. T. Brown succeeds C. Parker Holt as executive vice president. Mr. Brown was formerly vice president in charge of accounting, treasury, traffic and parts departments. Mr. Holt returns to the San Leandro, Calif., office where, as vice president he will direct all Caterpillar activities there and co-ordinate the work of the several departments with the headquarters of those departments in Peoria, Ill.

Two new vice-presidents have been elected. L. B. Neumiller, formerly director of industrial relations, is now vice-president administering the parts, service and traffic departments as well as continuing active management of industrial relations. D. G. Sherwin has been advanced from treasurer to vice-president, administering the advertising, sales and treasury departments. D. A. Robison, formerly assistant treasurer, succeeds Mr. Sherwin as treasurer.

Fairbanks, Morse & Co., Chicago, Ill., has appointed T. M. Robie as manager of the Diesel sales division, effective November 1, according to an announcement by A. C. Dodge, vice-president in charge of sales. Mr. Robie has been associated with Fairbanks-Morse since he returned from World War overseas service in 1919, serving in numerous capacities in the manufacturing and sales division. Since 1932 he had been in charge of Diesel sales to resale manufacturers. Previously, he was associated with the New York branch office for one year and the Dallas office for two years, and was employed at the factory on Diesel engine designing, testing and building for nine years.

T. M. Robie

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Penn., has appointed H. S. Schuler as division manager of industry advertising, according to an announcement by J. M. McKibbin, sales promotion and apparatus advertising manager. Mr. Schuler came to Westinghouse from the advertising agency of Ketchum, McLeod & Grove, Inc.

The Baker Equipment Engineering Co., Richmond, Va., has opened a new plant, according to President Jos. B. Baker. This company is a distributor for Gar Wood hoists and bodies and manufactures trailers commercial and public utility bodies.

1950° F for six years of continuous service. That is the record of this 7000 pound kiln end with a metal section of only ⅞".

They may be made in one piece, in halves or in any number of segments. PYRASTEEL kiln ends make tight sealing possible and offer the most economical means of saving fuel.

Write for money saving details.

CHICAGO STEEL FOUNDRY CO.
37th Street & Addis Ave.
CHICAGO, ILLINOIS
Makers of Alloy Steel for over 25 years

The Model "135" LOADER

is the fastest loading machine within $5,000 of its price, as well as heaviest, strongest and most powerful Loader built. It competes with BIG equipment. On a cost-per-yard basis, it's all alone. *Bulletin 134.*

Write, Wire or Telephone

HAISS

George Haiss Mfg. Co., Inc., Park Ave. & 143rd St., New York

Who, for over 40 years, have created and sold none but equipment of demonstrable superiority in design and manufacture.

Portable Conveyors—Bucket Loaders

BUILDERS SUPPLY, Inc.

Makes Money on Lime Putty, Mortar

A PROFITABLE INVESTMENT FOR SERVICE

The demand for ready-mixed Lime Putty and Lime Mortar is opening the way for sound, profitable opportunities throughout the country.

Masons, contractors, architects and builders are unanimous in their praise of READY-MIXED MORTAR AND PUTTY. It is a definite improvement in building construction, eliminating at least one operation and assuring a uniform and satisfactory material. All plants now operating at capacity.

For 25 years the C & G POTTS & COMPANY have designed, built and provided all equipment for complete CENTRAL MIXING MORTAR PLANTS. Write for complete details. Costs on your local requirements furnished on request.

C. & G. POTTS & Co.

INDIANAPOLIS, INDIANA

General Electric Co., Schenectady, N. Y., has appointed Chas. E. Wilson as executive vice president of the company, a new position, according to an announcement by President Gerard Swope. Mr. Wilson was formerly vice president in charge of the appliance and merchandise department. At the same time, Mr. Swope announced the election of Philip D. Reed as assistant to the president. Mr. Reed entered the employ of General Electric in 1926, and since 1934 has been general counsel of the lamp department with offices in New York.

Hercules Powder Co., Wilmington, Del., has announced the election of four new members to the Board of Directors. They are W. R. Ellis, general manager, Explosives department; Lloyd Kitchel, general manager, Virginia Cellulose department; P. W. Meyeringh, manager Foreign Relations department; and E. B. Morrow, who resigned his position as secretary of the company, also was elected a member of the Finance Committee. H. F. Smith, secretary to the president, was elected secretary.

Mr. Meyeringh became a member of the company in 1923 and has held various positions in the Foreign Relations Department.

Mr. Morrow joined Hercules in 1916. He became secretary to the president in 1925, and was elected secretary of the company in 1926 and assistant treasurer in 1934.

Mr. Ellis became associated with Hercules in July, 1915, serving as a technical service expert, and later as assistant manager of San Francisco office.

Prior to joining the company, Mr. Kitchel was associated with the textile industry. In 1926, he was appointed sales manager of Virginia Cellulose Department, and in May, 1937, he was named general manager.

Worthington Pump and Machinery Corp., Harrison, N. J., reports the appointment of W. E. Wechter as manager of Oil and Gas Engine Sales, Atlantic Division. He succeeds R. L. Howes, recently resigned. Since graduation from Purdue University in 1923, Mr. Wechter has been connected with the Worthington organization, having held successively the positions of salesman in Atlanta territory, Atlanta District Sales Manager, Detroit District Sales Manager, and Assistant manager of the Oil and Gas Engine Division. He will have his headquarters at the Worthington office, 2 Park avenue, New York City.

Foote Bros. Gear and Machine Corp., Chicago, Ill., has appointed Walter A. Hoppe, 948 South Grand Ave., Los Angeles, Calif., as southern California representative. Mr. Hoppe is a mechanical engineer with 17 years' experience in the power transmission equipment field.

Union Wire Rope Corp., Kansas City, Mo., has announced the appointment of Lester G. Schraub as general sales manager. Mr. Schraub will head a large sales and distributing organization which blankets the United States and has two special divisions. He brings to his new task a background of 23 years' experience in the steel and wire business. Prior to his new connection, Mr. Schraub had been 14 years with the Keystone Steel & Wire Co., Peoria, Ill., reaching the position of assistant sales manager, and his last position was with the Wire Division of the Sheffield Steel Corp., Kansas City, Mo., where he was manager of sales for nine years.

Broderick & Bascom Rope Co., St. Louis, Mo., has appointed O. B. Avery Co., distributor at St. Louis, Mo.

The Lincoln Electric Co., Cleveland, Ohio, manufacturer of arc welding equipment, announce the opening of a new sales engineering office at 400 North St., Bluefield, W. Va. The new office will be in charge of Wm. H. Schuster who, for the past year, has been assistant welding instructor in the Lincoln Welding School at Cleveland. Arthur T. Cox, Jr., has been appointed manager of its Tri-Cities welding sales-engineering office at Moline, Ill., effective November 1. Mr. Cox formerly worked in the company's Chicago office.

Productive Equipment Corp., Chicago, Ill., announces the appointment of H. P. Clauson as its New York representative located at 51 E. 42nd St.

COMPLETE MATERIAL HANDLING EQUIPMENT

When the trend of industry in '38 calls on your business to march forward with increased production, will your equipment permit you to produce at costs which will keep your prices in the competitive range?

Stephens-Adamson Engineers, trained to the minute in designing complete plants or any Material Handling Equipment for your requirements, are available to assist you in selecting the proper equipment to keep your costs at a minimum.

Get ready to realize a substantial return on your 1938 production. Call in an S-A trained engineer today!

CONVEYING . . . ELEVATING . . .
SCREENING . . . TRANSMISSION

BRANCHES IN PRINCIPAL CITIES

S-A
STEPHENS-ADAMSON MFG. CO.
7 Ridgeway Av.
AURORA . ILL.
Los Angeles, Cal. Belleville, Ont.

It took 1,700,000 TONS OF GRAVEL to wear it out

WHEN a large Ohio sand and gravel company built their plant in 1920 they asked the G.T.M.—Goodyear Technical Man—to specify a conveyor belt that would give good service in hauling gravel from the screens to the top of the 60 foot bins. After careful analysis the G.T.M. recommended a Goodyear belt built of five plies of 28 oz. duck, 568' long x 18" wide which was installed in April 1920.

For seventeen years this belt did its job faithfully, carrying approximately 100,000 tons of gravel up to the bins each season. For seventeen years it resisted the ravages of sun, rain, frost and abrasion until being honorably retired last summer, a worn veteran with 1,700,000 tons to its credit.

It is not by chance that Goodyear Conveyor Belts pile up so many records like this. Every Goodyear installation is specially built for its job with full consideration of all the many factors that affect conveyor belt life as reported by the G.T.M. Every Goodyear Belt is built with an exclusive mildew-inhibiting friction that resists the cancerous attacks of damp-rot that so quickly weaken many belts.

If you need a conveyor belt that will give you many years' service at lowest cost per ton, why not consult the G.T.M.? Just write Goodyear, Akron, Ohio, or Los Angeles, California—or the nearest Goodyear Mechanical Rubber Goods Distributor.

MORE TONS ARE HAULED ON GOODYEAR CONVEYOR BELTS THAN ON ANY OTHER KIND

What About the Business and Economic Questions

OF THE SAND AND GRAVEL AND READY MIXED CONCRETE INDUSTRIES?

Market in 1938 - - - - - - - -

What will be the volume of demand in 1938? Will there be any stimulation in the industrial building market and other sources of private building? To what extent will the Federal Government finance public works? Will states and other subdivisions of government resume their former activity in the public works field?

As to 1937 - - - - - - - - -

What actually happened in the sand and gravel and ready mixed concrete industries in 1937? What was the volume of business and how did it compare with 1936? How serious was the decline in demand because of the business recession starting in September?

Prices - - - - - - - - -

How did selling prices in 1937 compare with the preceding year? What is the price outlook for 1938? What form of cooperation will improve competitive conditions within the framework of the antitrust laws? To what extent did the sand and gravel industry suffer from governmental plants or from portable plants erected for specific projects?

Results of Governmental Policies - - -

Are the policies of the Federal Government contributing to such uncertainty in business that the construction program of the country is demoralized? What can be done to restore business confidence and thus release the great demand for building now admitted to exist? Can we expect any immediate results from Federal stimulation of home building? Is there any prospect of arresting the diversion by State governments of highway funds? To what extent has the diversion evil curtailed normal markets for the sand and gravel and ready mixed concrete industries in the highway and street building fields?

Labor Relations - - - - - - - -

What is the present status of employer-employee relations in the sand and gravel and ready mixed concrete industries? In how many communities have contracts been signed between the industries and organized labor? What is the nature of those contracts and what events preceded their signature? What are typical provisions for wages, hours, furlough, discharge, seniority, arbitration of disputes? Do the contracts provide for the open or closed shop, for the check-off, plant stewards? Have the contracts been between AFL or CIO unions? Have boycott threats been used, and if so, with what success? What do Federal and State laws require of employers as to collective bargaining?

THIS will give you an idea of just some of the important questions which will be discussed at the Twenty-second Annual Convention and Exposition of the National Sand and Gravel Association and the Eighth Annual Convention and Exposition of the National Ready Mixed Concrete Association, to be held concurrently at the Netherland Plaza Hotel, Cincinnati, Ohio, on January 31, February 1, 2, and 3, 1938. In the November and December issues of this magazine we told you about the legislative and engineering phases of the programs, and we want to remind you once more of the fine exposition of machinery and equipment used in the industries, in which leading manufacturers wll participate. All these things combine to make events in Cincinnati of extraordinary importance to you.

ALL MEMBERS OF THE SAND AND GRAVEL AND READY MIXED CONCRETE INDUSTRIES ARE CORDIALLY INVITED TO BE PRESENT

THE 21ST ANNUAL CONVENTION

of the

NATIONAL CRUSHED STONE ASSOCIATION

OFFERS TO CRUSHED STONE PRODUCERS A PROGRAM OF EXCEPTIONAL MERIT

Included among the topics scheduled for discussion are the following:

What is the Future of Private Enterprise?

Diesel Power in the Crushed Stone Industry.

The Correlation of the Los Angeles Rattler Test and Service Behavior.

Labor Relations in the Crushed Stone Industry.

Federal Wage and Hour Legislation.

Many other subjects of equal interest will appear on the program—all will be presented by men outstanding in their fields.

The Manufacturers' Division Exposition will be the largest and most comprehensive held in recent years—this feature alone well warrants attendance.

Plan now to be present at the

NETHERLAND PLAZA HOTEL

Cincinnati, Ohio

January 24, 25, and 26, 1938

for the most important event of the year to crushed stone producers.

Hard Cold Facts of the Rock Pile Mean Profits to You.

USE WEBSTER EQUIPMENT

CONVEYING - ELEVATING - SCREENING CRUSHED STONE

Track Hoppers	Feeders
Belt Conveyors	Stone Elevators
Structural Steel	Skip Hoist
Grizzlies	Revolving Screens
Circular Bins	Vibrating Screens
Bin Gates	Chicago Timken Rolls

Super-Capacity Bucket Elevators
Engineering Layout and Design

Call in the WEBSTER Man

His experience in this field enables him to consult with you and make practical recommendations for your requirements.

We back this man with a competent staff of engineers, each an experienced man in his field.

Write—wire or telephone

Just say "Send us the Webster Man."

The Webster Mfg. Co.

TIFFIN, OHIO

Over 60 years experience—Installations in some of the world's largest quarries and processing plants.

Manufacturers' Exhibits at the National Crushed Stone Ass'n Exposition, National Sand & Gravel Ass'n and National Ready Mixed Concrete Ass'n Exposition.

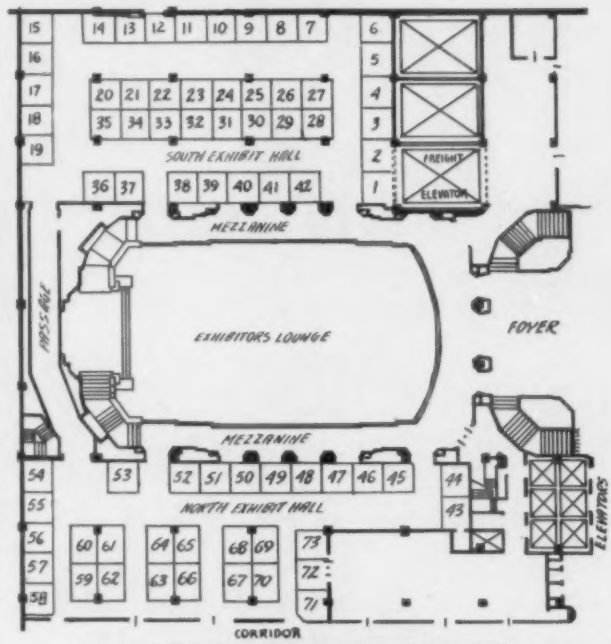


EXHIBIT HALLS OF NETHERLAND PLAZA HOTEL

(Same booth numbers for all three exhibits)

§ ***National Sand and Gravel Association and National Ready Mixed Concrete Association Convention.***

† ***National Crushed Stone Association Convention.***

Allis-Chalmers Manufacturing Co. §† **Booths 4-5-6**
Milwaukee, Wis.

Will display full size 3- x 10-ft. single-deck Low-Head vibrating screen with bottom plate, driven by sealclad squirrel cage motor through Texrope drive; model exhibit comprising vertical elevator, Utah electric feeder, Low-Head screen, Utah electric screen, crushing rolls, Utah electric conveyor; Vari-Pitch Texrope V-belt sheaves; photographs of style B Newhouse crusher and installations.

American Manganese Steel Co. §† **Booths 60-61**
Division of the American Brake Shoe & Foundry Co.
Chicago Heights, Ill.

Will exhibit a model of two-piece body renewable lip dippers, arranged so that it can be taken apart to demonstrate the construction; AMSCO repointer bars for rebuilding worn dipper teeth and AMSCO welding rods for reclamation work, including AMSCO nickel-manganese steel building-up welding rod and AMSCO No. 459 hard-facing welding rod.

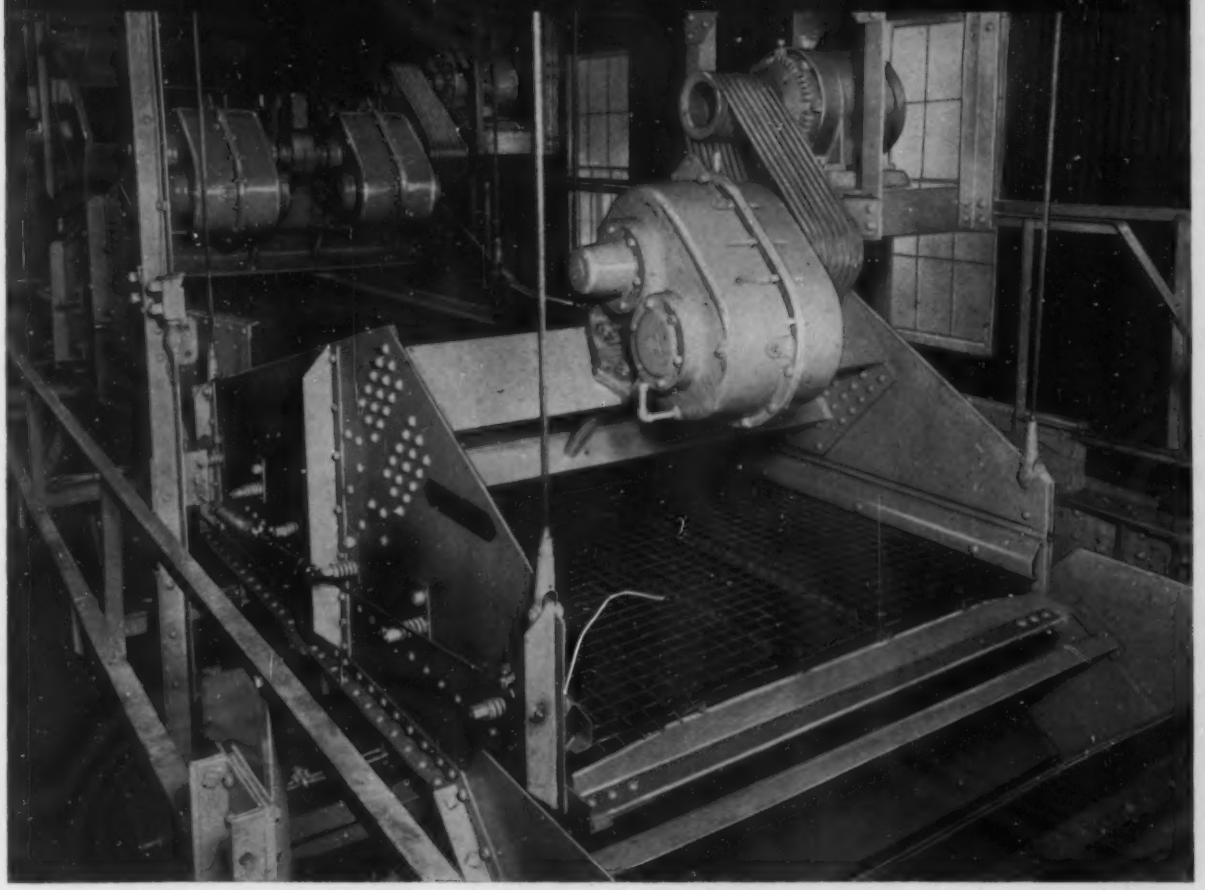
Atlas Powder Co. † **Booth 67**
Wilmington, Del.

Manufacturer of explosives, blasting caps, detonators, blasting machines and blasting supplies.

Blaw-Knox Co. §† **Booths 71-72**
Pittsburgh, Penn.

Manufacturer of truck mixers, ready-mixed concrete truck bodies, slackline and dragline buckets, storage bins, batching equipment, central mixing plants, hydrators.

LOW HEAD ROOM *Saves Money*



THE Allis-Chalmers Low-Head Horizontal Vibrating Screens give you greater screen area in less space ... greater tonnage of accurately sized stone and ore at lower cost than older, slower moving type of screens.

Low-Head Screens, as the name suggests, take very little head room. They operate with no inclination and so can be installed one right under another with little room between screens or in tandem in a horizontal plane as illustrated. This often saves expensive remodeling to obtain greater screen capacity.

Low-Head Screens are built with single, double or triple decks from 3'x 6' to 6'x 14' or larger. Allis-Chalmers Low-Head Screens are described in Bulletin 1478A. Write for your copy.

643

EQUIPMENT ENGINEERS TO INDUSTRY

ALLIS • CHALMERS

MILWAUKEE WISCONSIN

Completely controls the flow of any size material from Storage Bins, Hoppers or Open-Dump Chutes to Crushers, Conveyors, Screens, etc.

High in efficiency. Low in maintenance and power consumption.

Furnished in sizes to suit your operation. Send full particulars for recommendation.

ROSS SCREEN AND FEEDER CO.

19 Rector Street
NEW YORK, U. S. A.

2 Victoria Street
LONDON, S. W. 1., ENG.

Please Note Change of New York Address

Convention Exhibitors

Brooks-Taylor Co. of Birmingham, Ala. § **Booth 69**
Chicago Bridge and Iron Co.
Chicago, Ill.

Will have a joint display featuring the Brooks-Taylor lime putty plants which are fabricated at the Chicago Bridge & Iron Co. and operated under license from the Brooks-Taylor Co. The exhibit will consist of diagramatic illustration of the standard Brooks-Taylor lime putty plant, surrounded by views of various installations.

Bucyrus-Erie Co. §† **Booths 22-23**
So. Milwaukee, Wis.

Manufacturer of dragline and dredging buckets; bulldozers; bullgraders; dredge chain, clamshell and crawler cranes; dippers; draglines and walking draglines; dragline and dragline cableway excavators; dredges; drills; drill bits and drilling accessories; loaders; scrapers; steam, gas, electric, Diesel and oil-driven shovels.

Chain Belt Co. § **Booths 26-27-28-29**
Milwaukee, Wis.

Manufacturer of chain drives, elevator and conveyor chain, elevator and conveyor buckets, elevators and conveyors, conveyor idlers, flexible and shaft couplings, bin gates, feeders, gravel washing nozzles, power transmission equipment, sprockets and chains, central mixing plants and ready mixed concrete truck mixer bodies.

Cross Engineering Co. §† **Booth 53**
Carbondale, Penn.

Manufacturer of perforated metal screens and vibrating screen plates.

Dempster Bros., Inc. † **Booths 69-70**
Knoxville, Tenn.

Will display the DEMPSTER-DUMPSTER, detachable container for mounting on any make or model truck chassis for use where extensive hand loading of material is required.

E. I. duPont de Nemours & Co., Inc. † **Booths 54-55**
Wilmington, Del.

Manufacturer of explosives, blasting caps, detonators, blasting machines and blasting supplies.

Eagle Iron Works § **Booth 56**
Des Moines, Iowa

Will display small model of Eagle Swintek Screen Nozzle Ladder, sand screw washers, gravel washers, deshalers, sand tanks, sand drags and paddle type log washers.

Easton Car & Construction Co. † **Booth 73**
Easton, Penn.

Will display photographs of quarry cars, quarry motor truck bodies and semi-trailers, Easton-Clarmac electric bitumen heaters and weigh buckets.

Fairbanks, Morse & Co. § **Booths 18-19**
Chicago, Ill.

Manufacturer of automatic proportioning scales, cement scales, weighing equipment, gasoline and oil engines, Diesel engines, centrifugal pumps, motors and generators, Diesel electric generating sets, electric power equipment, power units and railway track and truck scales.

Frog, Switch & Mfg. Co. † **Booth 18**
Carlisle, Penn.

Manufacturer of manganese steel castings, crusher parts, screens, dredge pipe and chutes.

BLAW-KNOX PRESENTS NEW

3½ AND 4 cu. yd. TRUKMIXERS

• Among the many improvements in design of the new Blaw-Knox 3½ and 4 cu. yd. TRUKMIXERS are:—

• DRUMS AND MIXING BLADES of manganese alloy steel for greater strength and resistance to abrasion.

• ACCURACY OF WATER MEASUREMENT during transit regardless of truck position. Water splash in measuring tank does not effect accuracy.

• FASTER AND MORE THOROUGH MIXING with deeper mixing blades. End to end mixing action provided by openings between adjacent blade sections.

• EASY TO KEEP CLEAN. No projections inside the mixing drum for concrete to adhere to and build up.

• TIGHT Charging and Discharge DOORS. Machined steel doors and machined cast steel door seats—replaceable.

• SEALED BEARINGS AND ROLLERS (Oversized) for support of mixing drum and its load keep out concrete and dirt.

• SAFE GAS TANK located on catwalk of mixer, accessible for filling, away from the engine.

• POSITIVE CONTROLS. Dual controls front and rear include friction bearings at pivot points, stay in adjustment.

The Blaw-Knox line of TRUKMIXERS is *complete* with all sizes from 1 to 4 cu. yds. inclusive, and Agitators from 1½ to 6 cu. yds. inclusive.

BLAW-KNOX provides one dependable source for all ready mix plant equipment, including Truck Mixer Loading Plants; Wet Mix and Shrink Mix Plants with storage bins and measuring batchers for aggregates, cement and water, equipped with loading conveyors.

BLAW-KNOX DIVISION
OF BLAW-KNOX COMPANY
2035 FARMERS BANK BUILDING · PITTSBURGH, PA.
Offices and Representatives in Principal Cities

Only BLAW-KNOX Offers This Complete Service

Completely described in the New Blaw-Knox catalog No. 1582.

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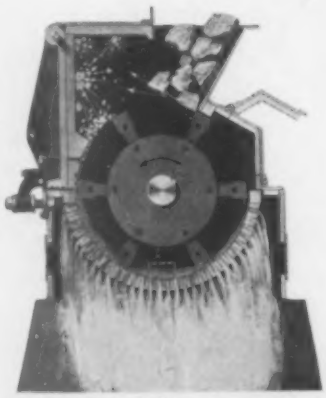

Jeffrey Type "B" Swing Hammer Pulverizer (Patented)

JEFFREY
CRUSHERS AND PULVERIZERS

Always reliable . . . always dependable. Jeffrey reduction units will eliminate a lot of worry pertaining to rejections (below specifications) of your product, when crushed from feed of a slabby or slivery nature.

Jeffrey swing hammer crushers and pulverizers will give you the most cubical product and sharpest corners for making the best bond with cement. They are equally efficient in the reduction of limestone, shale, clay, chalk, marl, gypsum, phosphate rock, asbestos rock and many other products in the stone products field.

Jeffrey equipment and plant engineering cover the entire stone products industry.

Send for Catalog No. 550-H.

The Jeffrey Manufacturing Co.
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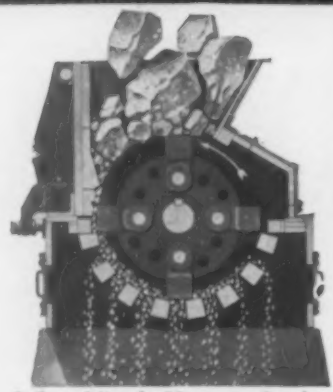

Jeffrey Miracle Hammer Crusher (Patented)

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Schenectady, N. Y.

Manufacturer of electric power equipment, motors, electric locomotives, electric railways, railway equipment, welding apparatus, generators and miscellaneous electrical equipment and accessories.

Hardinge Co., Inc. §† **Booth 34**
York, Penn.

Manufacturer of grinding mills, dryers, classifiers, feeders and scrubbers.

Harnischfeger Corporation §† **Booths 30-31**
Milwaukee, Wis.

Will show movies of various shovel installations operating in the rock products industry.

Hendrick Manufacturing Co. §† **Booth 3**
Carbondale, Penn.

Manufacturer of hopper bins; elevator and conveyor buckets; chutes; vibrating screen decks; perforated metal; double corrugated and vibrating screen plates; rotary, perforated, testing and vibrating screens; stacks and tanks.

Hercules Powder Co. † **Booths 28-29**
Wilmington, Del.

Manufacturer of explosives, blasting caps, detonators, blasting machines and blasting supplies.

The Jaeger Machine Co. § **Booths 51-52**
Columbus, Ohio

Manufacturer of truck mixers and truck mixer bodies, batchers, central mixing plants, hoists and centrifugal pumps.

The Jeffrey Manufacturing Co. §† **Booths 39-40**
Columbus, Ohio

Manufacturer of bucket elevators and conveyors; crushing rolls; grizzlies; loaders and unloaders; vibrating tube and pan feeders; pulverizers; vibrating screens; grizzly feeders; jaw, gyratory and hammer crushers; bins; coal crushers; skip hoists and skips; sand settling tanks; transmission machinery; sand, gravel and stone washers; screw conveyors; portable conveyors; electric vibrating coolers; belt idlers, electric vibrating screens and other material handling equipment; aggregate plant engineers.

Kennedy-Van Saun Mfg. & Eng. Corp. † **Booth 11**
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Manufacturer of grinding balls, bin gates, steel bins, castings, classifiers, coal pulverizing equipment, conveyors and elevators, crushers and crusher parts, dryers, feeders, grizzlies, mill liners, grinding mills, pulverized fuel systems, pulverizers, rod mills, screens. Engineers.

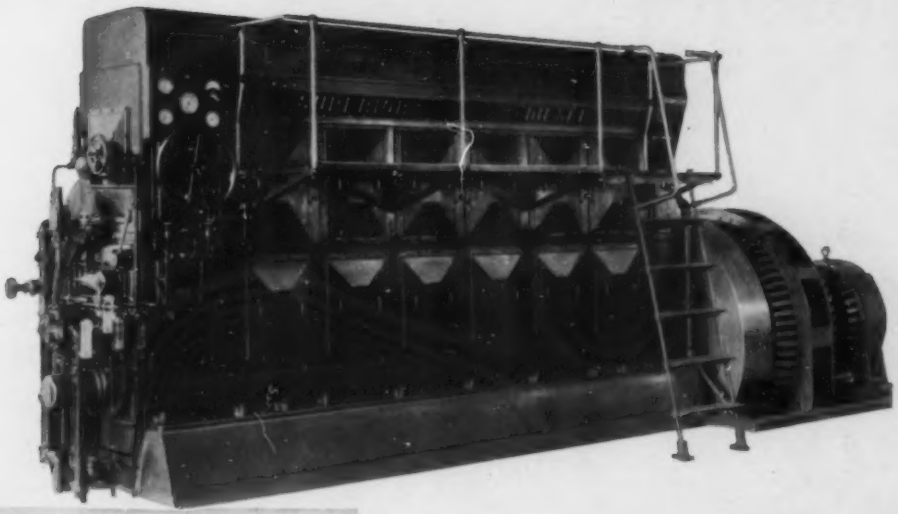
Kensington Steel Co. § **Booth 38**
Chicago, Ill. † **Booth 27**

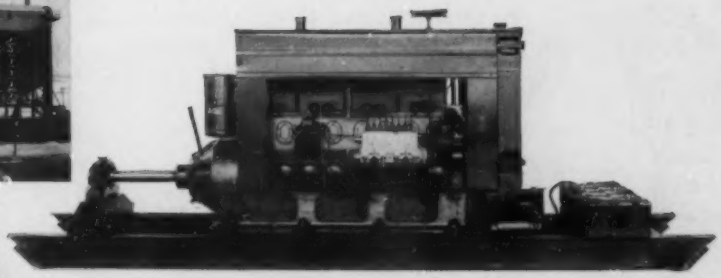
Will display photographs showing various applications of ORO special manganese steel for crushers, power shovels, and miscellaneous equipment used in crushed stone and sand and gravel plants.

Koehring Company §† **Booths 45-46**
Milwaukee, Wis.

Manufacturer of pavers, mixers, cranes, shovels, draglines, construction mixers, mud-jacks, dumptors and trail dumps.

WE'LL BE THERE..





Superior DIESELS

HEAVY DUTY MODELS: 50 to 810 H.P., 250 to 720 R.P.M.

HIGH SPEED MODELS: 15 to 150 H.P., 900 to 1800 R.P.M.

Old friends and new friends of Superior Diesels in the rock crushing, quarrying and sand and gravel industries—meet us at the 21st Annual Convention and Exhibition of the National Crushed Stone Association, to be held at the Netherland Plaza Hotel, Cincinnati, Ohio, January 24-25-26—also at the 22nd Annual Convention and Exhibition of the National Sand and Gravel Association, to be held same place, February 1-2-3.

There, you may see one of Superior's completely equipped portable Diesels (illustrated above) which is so effective when spotted in a pit or quarry, exactly where economical power is needed . . . Information on the larger Superior Diesels, too, will be waiting for you . . . We'll be glad to see you.

THE NATIONAL SUPPLY COMPANY • SUPERIOR ENGINE DIVISION

FACTORIES: Springfield, Ohio; Philadelphia, Pa. · SALES OFFICES: Springfield, Ohio; Philadelphia, Pa.; New York, N. Y.; Los Angeles, Calif.; Houston, Texas.

EAGLE SCREW WASHER

Daily recovers over six cars of sand formerly wasted

Eagle Screw Washer Daily Recovers Over Six Cars of Sand Formerly Wasted.

The Concrete Materials Corporation of Waterloo, Iowa, installed this 18 inch twin screw washer which recovers commercial sand able to qualify for the Illinois State Specifications. Before this installation only gravel was produced and the sand pumped back into the lake, a total loss.

Two other pieces of EAGLE equipment play a very important part in the remarkable production record of the plant. A 40 foot "Swintek" ladder mounted on a barge is used for excavating, and a 20-inch twin screw EAGLE WASHER effectively washes and dewaters about 80 tons of sand per hour for mixing with gravel to meet the specifications for ballast.

This is only one of countless ways EAGLE WASHERS are building big profits for producers everywhere.

Our engineers are specialists in all aggregate washing problems. Let us help you solve yours. Write today for details.

EAGLE IRON WORKS

DES MOINES, IOWA

Convention Exhibitors

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Manufacturer of wire rope, aerial tramways, wire rope fittings and slings.

Lima Locomotive Works, Inc. §† **Booth 1**
Lima, Ohio
Will exhibit photographs of installations and a small working model of one of its shovels.

Link-Belt Co. §† **Booths 12-13-14**
Chicago, Ill.
Will show operating models of vibrating screen, a Rotoscoop and a twin screw washer; a representative line of elevating and power transmission chains and transmission items; latest types of belt conveyor idlers; and will have available literature pertaining to all products displayed.

Marion Steam Shovel Co. §† **Booth 68**
Marion, Ohio
Manufacturer of crawler and locomotive cranes; steam, gas and electric shovels; dippers and dipper teeth; draglines and dragline excavators; loaders and unloaders.

The National Supply Co. §† **Booths 24-25**
Superior Engine Division
Toledo, Ohio
Manufacturer of Diesel engines.

Nordberg Manufacturing Co. §† **Booth 36-37**
Milwaukee, Wis.
Manufacturer of crushers, screens, classifiers, underground shovels, track shifters, Diesel engines, compressors and hoists.

Northern Blower Co. † **Booth 19**
Cleveland, Ohio
Manufacturer of dust collecting systems, air filters, air separators, dust blowers, dust conveying systems, dust arresters and fans. Engineers.

Peoria Steel & Wire Co. † **Booth 65**
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Manufacturer of steel and wire products.

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Chicago, Ill.
Manufacturer of dredge pumps, traveling chain, cutters, shovel dippers, manganese steel castings, and railroad track accessories.

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Manufacturer of jaw and roll crushers; portable crushing plants; horizontal gradation screens; inclined vibrating screens; revolving screens and scrubbers; belt conveyors and units; sand drags; and complete gravel, quarry, crushing, screening, loading, washing and stabilizer plants.

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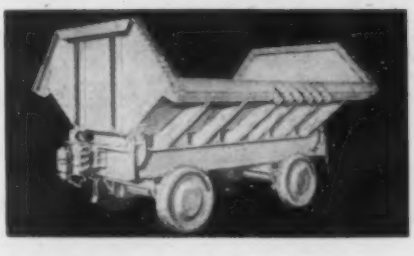
Ransome Concrete Machinery Co. § **Booths 59-62**
Dunellen, N. J.
Manufacturer of truck mixers, mixers for central mixing plants, and bituminous mixers.

EASTON



QUARRY TRANSPORTATION

The Easton Car and Construction Company offers the last word in economical transportation designed specifically for the rock products industry.

The tractor-trailer unit shown above is our very latest development. It possesses the advantages of a material reduction in initial cost and immediate and low repair costs. The haulage cost over the season in one quarry was $0.0197 per ton, including all repairs and depreciation.

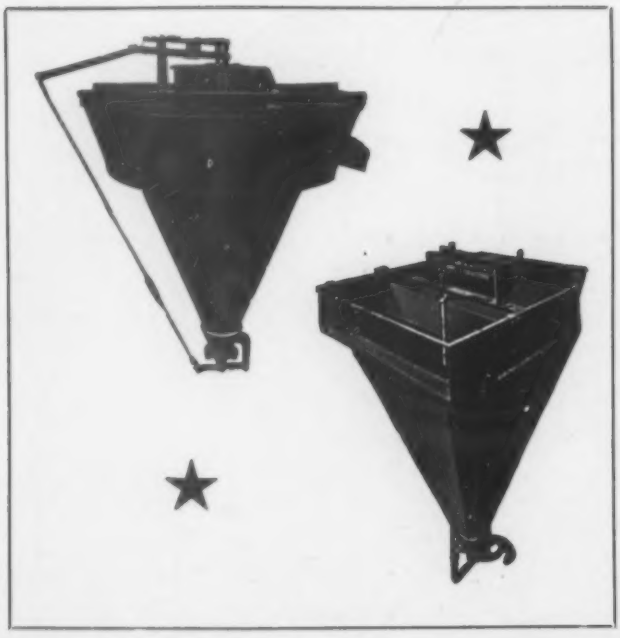
Phoenix Truck Bodies and Quarry Cars are built without doors or gates and can be dumped from either side.

WonWay Truck Bodies and Quarry Cars are particularly adapted to conditions where it is necessary to dump from only one side in the case of quarry cars and off the end of trucks.

All types are built to stand up under the severe test of quick loading, can be unloaded in the least possible time, will carry a maximum load continuously and are so rugged they will stay on the job and not lose time in a repair shop.

Let our engineers analyze your hauling problems and help you solve them. No obligation.

EASTON CAR & CONSTRUCTION CO. Glendon Street EASTON, PENN.



How ALLEN CONES *and* TANKS *Improve Your Product.....*

Better grading, elimination of practically all clay because of the better washing action, greater capacity, automatic operation, freedom from attention and negligible maintenance costs all add up to the answer to your classifying problems.

ALLEN CONES AND TANKS give continuously uniform, accurately classified, thoroughly clean and dewatered products.

By using two or more Allen Cones or Tanks in series a number of products can be made from materials that are now being wasted or sold as a single product.

We have specialized in material classification and our experience covers a wide field. Why not let us assist you in solving your classifying problems.

Write for details.

Allen Cone & Machinery Corp.
ENGINEERS
30 CHURCH ST. NEW YORK CITY

Convention Exhibitors

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Sauerman Bros., Inc. § **Booth 55**
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Will arrange their booth for the comfort of visitors and will distribute booklets containing information on the uses of Sauerman drag scrapers and slackline machines and of Sauerman scraper buckets in excavating and handling materials.

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Will display a 3- x 8-ft. double-deck SECO vibrating screen.

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High Bridge, N. J.
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The Thew Shovel Co. §† **Booths 15-16**
Lorain, Ohio
Manufacturer of Diesel and electric shovels, underground shovels, locomotive and crawler cranes, clamshell cranes, dragline excavators, motor truck cranes and shovels and crawler shovels.

Transit Mixers, Inc. § **Booth 54**
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Manufacturer of truck mixers.

Traylor Engineering & Manufacturing Co.
Allentown, Penn. §† **Booths 32-33**
Manufacturer of bin gates; crusher feeders; crushing rolls; elevators; friction hoists; grizzlies; jaw and gyratory crushers; portable crushers; pulverizers; rotary screens; scrubbers; trommel screens; ballast, gravel, rock asphalt, sand and slag plants; cement and lime plant equipment.

The W. S. Tyler Co. §† **Booths 20-21-35**
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Manufacturer of electric motors and generators, speed reducers, electric locomotives, welders, welding rods, and other electrical products.

Speed! Speed! Speed!

CRIES INDUSTRY

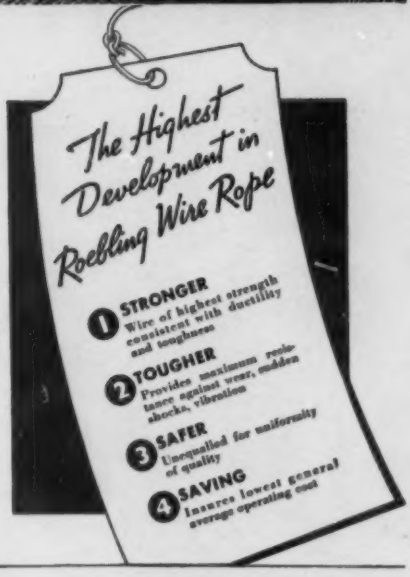
Today's severe demands on equipment call for utmost wire rope stamina

Industry must reduce costs—to make profits. More work from existing equipment—and faster.

Roebling "Blue Center" Steel Wire Rope has more than met these exceptionally severe requirements.

Roebling "Blue Center" combines the highest strength with the maximum resistance against fatigue and wear. For a wide variety of applications where service conditions are exceptionally severe, *it has proved conclusively that it assures lowest general average operating costs.*

JOHN A. ROEBLING'S SONS CO., TRENTON, N. J. *Branches in Principal Cities*


The Highest Development in Roebling Wire Rope
1 STRONGER
Wire of highest strength consistent with ductility and toughness
2 TOUGHER
Provides maximum resistance against wear, sudden shocks, vibration
3 SAFER
Unequalled for uniformity of quality
4 SAVING
Insures lowest general average operating cost

ROEBLING ★ BLUE CENTER

DIRECTORY
OF MANUFACTURERS' PRODUCTS

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"At this rate, the oil will outlast the turbine.." SAYS POWER PLANT MANAGER

GULFCREST OIL

Demonstrates Phenomenal Stability in Turbine Systems of Leading Plants and in Laboratory Tests

"This is the most remarkable experience we have ever had with a turbine oil," says the manager of a big power plant in which Gulfcrest oil is in service. "Deterioration has been so slight that, at this rate, the oil will far outlast the turbine."

Many power plant operators who have had Gulfcrest oil in service a year or more are prepared to make similar statements. But of equal interest are the results of laboratory tests shown in the graphs below. They clearly illustrate the phenomenal stability of Gulfcrest oil as compared with what have been heretofore considered as good turbine lubricants.

Where, under accelerated oxidation tests, a normally good commercial turbine oil begins to oxidize rapidly at about 200 hours, Gulfcrest oil shows practically no deterioration in several months' continual punishment in the testing apparatus. Its marked superiority is so definitely established that there is practically no basis for comparison between this Alchlor processed turbine oil and others. (Gulfcrest is refined by the same exclusive Gulf process as Gulfpride—the world's finest motor oil.)

We suggest that you talk with a Gulf engineer about this remarkable turbine oil at your first opportunity.

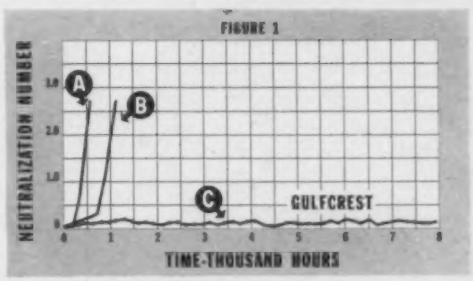

Fig. 1 shows the effect of accelerated oxidation at 210° F. in the presence of copper, iron and water on the *neutralization numbers* of three different turbine oils. Curve C shows the marked superiority of Gulfcrest oil (This test was made in the laboratory of the Gulf Research & Development Company.)

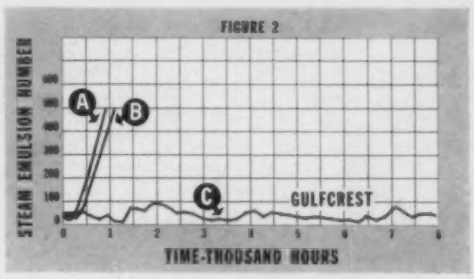

Fig. 2 shows the effect of accelerated oxidation at 210° F. in the presence of copper, iron and water on the *steam emulsion numbers* of three different turbine oils. Curve C—representing Gulfcrest oil—shows the marked superiority of this Alchlor treated lubricant (This test was made in the laboratory of the Gulf Research & Development Company.)

GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION
GULF REFINING COMPANY
GENERAL OFFICES: GULF BUILDING, PITTSBURGH, PA.

DIRECTORY OF MANUFACTURERS' PRODUCTS—*Continued*

Boston Woven Hose & Rubber Co., Boston, Mass.
Central Rubber & Sup. Co., Indianapolis, Ind.
Cincinnati Rubber Mfg. Co., Cincinnati, O.
Gilmer, L. H. Company, Philadelphia, Pa.—36
Goodrich, B. F. Co., Akron, O.—3, 176
Goodyear Tire & Rubber Co., Inc., Akron, O.—125
Hewitt Rubber Corp., Buffalo, N. Y.
Link-Belt Co., Chicago, Ill.—1
Manhattan Rubber Mfg. Co., Passaic, N. J.
New York Belting & Packing Co., New York, N. Y.
Quaker City Rubber Co., Philadelphia, Pa.
Republic & Sup. Co., Indianapolis, Ind.
Smidth, F. L. & Co., New York, N. Y.—Front Cover
Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Thermoid Rubber Company, Trenton, N. J.
United States Rubber Products, Inc., New York, N. Y.
Victor Balata & Textile Belting Co., New York, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

BELTING (V-Type)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
Gilmer, L. H. Co., Philadelphia, Pa.—36
Goodrich, B. F. Company, Akron, O.—3, 176
Goodyear Tire & Rubber Co., Inc., Akron, O.—125
Link-Belt Company, Chicago, Ill.—1
Rockwood Mfg. Co., Indianapolis, Ind.
Thermoid Rubber Co., Trenton, N. J.
Wood's Sons Co., L. H., Chambersburg, Pa.

BELTING (Wire)

Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Wickwire Spencer Steel Co., New York, N. Y.—173

BELT TIGHTENERS

Robins Conveying Belt Co., New York, N. Y.—159
Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Wood's Sons Co., T. B., Chambersburg, Pa.

BIN GATES

Allen-Sherman-Hoff Co., Philadelphia, Pa.—Inside Front Cover
Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
Bacon, Earle C., Inc., New York, N. Y.—118
Besser Mfg. Co., Alpena, Mich.—111
Chain Belt Co., Milwaukee, Wis.
Erie Steel Const. Co., Erie, Pa.
Fuller Company, Catasauqua, Pa.—147
Good Roads Machinery Corp., Kennett Square, Pa.
Haiss, Geo., Mfg. Co., Inc., New York, N. Y.—123
Heltzel Steel Form & Iron Co., Warren, O.
Industrial Brownhoist Corp., Cleveland, O.—157
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Link-Belt Company, Chicago, Ill.—1
McLanahan & Stone Corp., Hollidaysburg, Pa.—28
Robins Conveying Belt Co., New York, N. Y.—159
Smith Engr. Works, Milwaukee, Wis.—23
Sprout, Waldron & Co., Inc., Muncy, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Toepfer & Sons Co., W. Milwaukee, Wis.
Traylor Engineering & Mfg. Co., Allentown, Pa.—7
Universal Road Machy. Co., Kingston, N. Y.—16, 17
Webster Mfg. Co., Tiffin, O.—128

BINS (Storage)

Atlas Car & Mfg. Co., Cleveland, O.
Austin-Western Road Machinery Co., Aurora, Ill.—9
Besser Mfg. Co., Alpena, Mich.—111
Blaw-Knox Co., Pittsburgh, Pa.—131
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Burrell Eng. & Const. Co., Chicago, Ill.
Butler Bin Co., Waukesha, Wis.—22
Chain Belt Co., Milwaukee, Wis.
Chicago Bridge & Iron Co., Chicago, Ill.—121
Diamond Iron Works, Inc., Minneapolis, Minn.
Eagle Iron Works, Des Moines, Ia.—134
Erie Steel Constr. Co., Erie, Pa.
Good Roads Machinery Corp., Kennett Square, Pa.
Hardinge Co., Inc., York, Pa.—47
Heltzel Steel Form & Iron Co., Warren, Pa.
Hendrick Mfg. Co., Carbondale, Pa.—153
Jeffrey Mfg. Co., Columbus, O.—132
Johnson, C. B. Co., Champaign, Ill.
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Link-Belt Co., Chicago, Ill.—1
Long, M. A. Co., Baltimore, Md.
MacDonald Engineering Co., Chicago, Ill.
Marietta Concrete Corp., Marietta, O.
Neff & Fry Co., Camden, O.
Northern Blower Co., Cleveland, O.
Parsons Engr. Corp., Cleveland, O.
Pioneer Engineering Wks., Inc., Minneapolis, Minn.—14
Richardson Scale Co., Clifton, N. J.—149
Robins Conveying Belt Co., New York, N. Y.—159
Smidth, F. L. & Co., New York, N. Y.—Front Cover
Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Traylor Engineering & Mfg. Co., Allentown, Pa.—7
Universal Crusher Co., Cedar Rapids, Ia.
Universal Road Machy Co., Kingston, N. Y.—16, 17
Webster Mfg. Co., Tiffin, O.—128

BITS (Drill)

Bucyrus-Erie Co., South Milwaukee, Wis.—Outside Back Cover
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York, N. Y.—21
Sullivan Mchy. Co., Chicago, Ill.
Timken Roller Bearing Co., Canton, O.—6

BLASTING MACHINES

Atlas Powder Company, Wilmington, Del.
Burton Explosives, Inc., New York, N. Y.
Du Pont de Nemours, E. I. & Co., Wilmington, Del.
Halafax Explosives Company, Wilmington, Del.
Illinois Powder Mfg. Co., St. Louis.

BLASTING SUPPLIES

Atlas Powder Co., Wilmington, Del.
Burton Explosives, Inc., New York, N. Y.
Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.
Halafax Explosives Co., Los Angeles, Calif.
Hercules Powder Co., Wilmington, Del.—13
Illinois Powder Mfg. Co., St. Louis, Mo.
Independent Explosives Co., Cleveland, O.

BLOCK MACHINES (Concrete)

Anchor Concrete Machy. Co., Columbus, O.—110
Besser Mfg. Co., Alpena, Mich.—111
Hollostone Co., No. Hollywood, Calif.
Miles Mfg. Co., Jackson, Mich.
Multiplex Concrete Machy. Co., Elmore, O.—115
Sill & Rawlings Concrete Block Co., Tonganoxie, Kan.
Stearns Mfg. Co., Adrian, Mich.—108

BLOCKS (Pillow)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
American Hoist & Derrick Co., St. Paul, Minn.
Chain Belt Co., Milwaukee, Wis.
Fairfield Engr. Co., Marion, O.
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Co., New York, N. Y.
Link-Belt Company, Chicago, Ill.—1
Manitowoc Engr. Wks., Manitowoc, Wis.—30
Stephens-Adamson Mfg. Co., Aurora, Ill.—124

BLOCKS (Pillow, Roller Bearings)

Jeffrey Mfg. Co., Columbus, O.—132
Link-Belt Company, Chicago, Ill.—1
Oliver Machinery Co., Grand Rapids, Mich.
Robins Conveying Belt Co., New York, N. Y.—159
SKF Industries, Inc., New York, N. Y.—34
Standard Pressed Steel Co., Jenkintown, Pa.—143
Timken Roller Bearing Co., Canton, O.—6

BLOCKS (Sheave)

American Hoist & Derrick Co., St. Paul, Minn.
American Manganese Steel Co., Chicago Heights, Ill.—46
Clyde Iron Works, Inc., Duluth, Minn.
Link-Belt Company, Chicago, Ill.—1
Pioneer Engr. Wks., Inc., Minneapolis, Minn.—14
Roebling's, John A. Sons Co., Trenton, N. J.—137
Sauerman Bros., Chicago, Ill.—159

BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
De Laval Steam Turbine Co., Trenton, N. J.
Jeffrey Mfg. Co., Columbus, O.—132
Sly, W. W. Mfg. Co., Cleveland, O.—38

BOATS (Derrick)

Chicago Bridge & Iron Co., Chicago, Ill.—121
Manitowoc Engr. Wks., Manitowoc, Wis.—30

BOATS (Self-Unloading)

Link-Belt Company, Chicago, Ill.—1
Robins Conveying Belt Co., New York, N. Y.—159
Smith, Leathem D. Dock Co., Chicago, Ill.
Stephens-Adamson Mfg. Co., Aurora, Ill.—124

BODIES (Dump)

Commercial Shearing & Stamping Co., Youngstown, O.—114
Easton Car & Constr. Co., Easton, Pa.—135
Heil Company, Milwaukee, Wis.
Superior Body Co., Marion, Ind.

BODIES (Dump Truck)

Athey Truss Wheel Co., Chicago, Ill.
Dempster Bros., Knoxville, Tenn.—8
Dodge Motor Co., Detroit, Mich.
Federal Motor Truck Co., Detroit, Mich.
Garwood Industries, Inc., Detroit, Mich.
Hug Company, Highland, Ill.

BODIES (MIXER TRUCK)

Blaw-Knox Co., Pittsburgh, Pa.—131
Chain Belt Co., Milwaukee, Wis.
Concrete Transport Mixer Co., Inc., St. Louis, Mo.
Jaegger Machine Co., Columbus, O.—15
Lee Transit Mixer Co., Indianapolis, Ind.
Ransome Concrete Machy. Co., Dunellen, N. J.
Smidth, F. L. & Co., New York, N. Y.—Front Cover
Smith, T. L., Co., Milwaukee, Wis.

BOILERS

American Hoist & Derrick Co., St. Paul, Minn.
Babcock & Wilcox Co., New York, N. Y.—167
Combustion Engineering Co., Chicago, Ill.—29
Manitowoc Engr. Wks., Manitowoc, Wis.—30
Orr & Sembower, Inc., Reading, Pa.
Union Iron Works, Erie, Pa.

BOILERS (Waste Heat)

Combustion Engineering Company, Chicago, Ill.—29

BRICK MACHINES

Besser Mfg. Co., Alpena, Mich.—111
Deister Concentrator Co., Ft. Wayne, Ind.
Dunn, W. E., Mfg. Co., Holland, Mich.
Jackson & Church Co., Saginaw, Mich.—114
Miles Mfg. Co., Jackson, Mich.
Multiplex Concrete Machy. Co., Elmore, O.—115
R. & L. Concrete Machinery Co., Kendallville, Ind.—108, 114
Stearns Mfg. Co., Adrian, Mich.—108

BUCKET PARTS

Erie Steel Const. Co., Erie, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Sullivan Machy. Co., Chicago, Ill.

BUCKETS (Clamshell, Grab & Orange Peel)

Blaw-Knox Company, Pittsburgh, Pa.—131
Diamond Iron Works, Inc., Minneapolis, Minn.
Erie Steel Constr. Co., Erie, Pa.
Haiss, Geo., Mfg. Co., Inc., New York, N. Y.—123
Harnischfeger Corp., Milwaukee, Wis.—10
Hayward Company, New York, N. Y.—165
Industrial Brownhoist Corp., Cleveland, O.—157
Jaeger Machine Co., Columbus, O.—15
Link-Belt Company, Chicago, Ill.—1
Manitowoc Engr. Wks., Manitowoc, Wis.—30
Owen Bucket Company, Cleveland, O.—163
Robins Conveying Belt Co., New York, N. Y.—159
Wellman Engineering Co. (G. H. Williams), Cleveland, O.

BUCKETS (Conveyor & Elevator)

Bacon, Earle C., Inc., New York, N. Y.—118
Chain Belt Co., Milwaukee, Wis.
Cross Engineering Co., Carbondale, Pa.—155
Fairfield Engineering Co., Marion, O.
Good Roads Machinery Corp., Kennett Square, Pa.
Hendrick Mfg. Co., Carbondale, Pa.—153
Huron Industries, Inc., Alpena, Mich.—161
Industrial Brownhoist Corp., Cleveland, O.—157
Jaeger Machine Co., Columbus, O.—15
Jeffrey Mfg. Co., Columbus, O.—132
Lewistown Foundry & Machine Co., Lewistown, Pa.—107
Link-Belt Company, Chicago, Ill.—1
McLanahan & Stone Corp., Hollidaysburg, Pa.—28
Pettibone Mulliken Co., Chicago, Ill.—24
Pioneer Engineering Works, Inc., Minneapolis, Minn.—14
Ransome Concrete Machinery Co., Dunnellen, N. J.
Robins Conveying Belt Co., New York, N. Y.—159
Sprout, Waldron & Co., Inc., Muncy, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.—39
Toepfer, W., & Sons Co., Milwaukee, Wis.

BUCKETS (Dragline & Slackline)

American Manganese Steel Co., Chicago Heights, Ill.—46
Austin Western Road Machy Co., Aurora, Ill.—9
Bay City Shovels, Inc., Bay City, Mich.—44
Besser Mfg. Co., Alpena, Mich.—104
Blaw-Knox Co., Pittsburgh, Pa.—131
Bucyrus-Erie Co., South Milwaukee, Wis.—Outside Back Cover
Erie Steel Constr. Co., Erie, Pa.
Gruendler Crusher & Pulverizer Co., St. Louis, Mo.—163
Harnischfeger Corp., Milwaukee, Wis.—10
Hayward Company, New York, N. Y.—165
Hendrick Mfg. Co., Carbondale, Pa.—153
Interstate Equipt. Corp., Elizabeth, N. J.
Link-Belt Co., Chicago, Ill.—1
Owen Bucket Co., Cleveland, O.—163
Page Engr. Co., Chicago, Ill.
Pioneer Engineering Works, Minneapolis, Minn.—14
Sauerman Brothers, Inc., Chicago, Ill.—159
Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Wellman Engineering Co. (G. H. Williams), Cleveland, O.

BUCKETS (Dredge & Excavator)

Bucyrus-Erie Co., So. Milwaukee, Wis.—Outside Back Cover

CARRYALLS FURNISH LOW-COST GRAVEL for CONCHOS DAM

One of 4 LeTourneau Y-13 Carryall Scrapers on its way to the hopper. Every load averaged 10 yards of concrete gravel—after the non-usable material was removed . . . (Inset) Dumping into the hopper, onto the conveyor belt is accomplished in less than a minute. Digging, hauling and accurate dumping of the Carryall cuts equipment investment.

Conchos Dam contractors, Bent Brothers, Inc. and Griffith Company, are moving 1,200,000 cubic yards of material to furnish gravel for all concrete going into the project. Their long experience has taught them how to do it cheaply and profitably.

Four LeTourneau Y-13 Carryall Scrapers were assigned the job; removed 300,000 cubic yards of overburden as a starter. Now, working in a figure 8 fashion over an 8,600 ft. round trip haul, these Carryalls make a complete cycle every 20.06 minutes—dump 2 loads averaging 10 yards each of washed sand and gravel into the screening plant conveyor hopper; or average 60 yards per Scraper of pay material every hour.**

A LeTourneau Heavy Duty Rooter is on the job to loosen tight or cemented gravel for fast Carryall loading—saves costly blasting. To complete this cheaper method of gravel excavation, a LeTourneau Angledozer is used as a general utility tool. Thus, on this job, as on hundreds of stripping jobs the country over, LeTourneau equipment has again proved it digs, hauls and delivers more yardages quicker, cheaper and with smaller equipment investment than other methods offer.

Government Forces use LeTOURNEAU, too! An order has just been placed by the U. S. Engineers Department for 4 LeTourneau Angledozers to help bring Conchos Dam work to a low-cost conclusion.

See your "Caterpillar" tractor dealer . . . he can show you how LeTourneau low-cost operation will help you make new profits from seemingly "impossible" materials-handling jobs.

ACTUAL JOB DATA

****The data contained in this advertisement was gathered and its accuracy certified by our Field Engineering Department, whose members visit the major earthmoving projects of the country, and learn the latest and best of current stripping practices. We invite you to call for aid in estimating and planning materials-moving problems.**

R. G. LeTOURNEAU, Inc.

PEORIA, ILLINOIS **STOCKTON, CALIFORNIA**

Cable Address: "Bobletorno"

Manufacturers of: Angledozers*, Buggies*, Bulldozers, Carryall* Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters*, Treedozers.

*Name registered in U. S. Patent Office.

LETOURNEAU

DIRECTORY OF MANUFACTURERS' PRODUCTS—*Continued*

Cross Engineering Co., Carbondale, Pa. —155
Haiss, Geo., Mfg. Co., Inc., New York, N. Y.—123
Harnischfeger Corp., Milwaukee, Wis.—10
Hayward Co., New York, N. Y.—165
Owen Bucket Co., Cleveland, O.—163
Wellman Engineering Co. (G. H. Williams), Cleveland, O.

BUCKETS (Weighing)

Easton Car & Const. Co., Easton, Pa.—135

BULLDOZERS

Blaw-Knox Co., Pittsburgh, Pa.—131
Bucyrus-Erie Co., South Milwaukee, Wis. —Outside Back Cover
Koehring Co., Milwaukee, Wis.—37
Le Tourneau, R. E., Inc., Peoria, Ill.—141

BULLSCRAPERS

Bucyrus-Erie Co., South Milwaukee, Wis. —Outside Back Cover

BURNERS (Kiln)

Babcock & Wilcox Co., New York, N. Y. —167
Smidth, F. L. & Co., New York, N. Y.— Front Cover

BUSHINGS

Eagle Iron Works, Des Moines, Ia.—134
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Link-Belt Co., Chicago, Ill.—1
Manganese Steel Forge Co., Inc., Philadelphia, Pa.
National Bearing Metals Corp., St. Louis, Mo.
Stephens-Adamson Mfg. Co., Aurora, Ill. —124
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wood's, T. B., Sons Co., Chambersburg, Pa.

CABLEWAYS

American Cable Co., New York, N. Y.— Inside Back Cover
American Steel & Wire Co. (United States Steel Subsidiary), Cleveland, O.
Blaw-Knox Co., Pittsburgh, Pa.—131
Broderick & Bascom Rope Co., St. Louis, Mo.—18
General Electric Co., Schenectady, N. Y.— 26, 27
Hazard Wire Rope Co., Wilkes-Barre, Pa.
Interstate Equipment Corp., Elizabeth, N. J.
Leschen, A., & Sons Rope Co., St. Louis, Mo.—119
Link-Belt Company, Chicago, Ill.—1
MacWhyte Company, Kenosha, Wis.—11
Roebling's, John A., Sons Co., Trenton, N. J.—137
Sauerman Brothers, Inc., Chicago, Ill.—159
Wellman Engineering Co., Cleveland, O.
Wickwire Spencer Steel Co., New York, N. Y.—173

CALCINING EQUIPMENT

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Bartlett Snow Co., Cleveland, O.—107
Blaw-Knox Co., Pittsburgh, Pa.—131
Bradley Pulverizer Co., Allentown, Pa.
Calcium Chloride Assn., Detroit, Mich.—145
Ehrsam, J. B., & Son Mfg. Co., Enterprise, Kan.
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Manitowoc Engr. Wks., Manitowoc, Wis. —30
Smidth, F. L., & Co., New York, N. Y.— Front Cover
Traylor Engr. & Mfg. Co., Allentown, Pa. —7

CALCIUM CHLORIDE

Calcium Chloride Assn., Detroit, Mich.—145
Columbia Alkali Corp., Barberton, O.
Dow Chemical Co., Midland, Mich.
Michigan Alkali Corp., New York, N. Y.
Solvay Sales Corp., New York, N. Y.

CAPS (Blasting)

Atlas Powder Company, Wilmington, Del.
Burton Explosives, Inc., New York, N. Y.
Du Pont, E. I., de Nemours & Co., Inc., Wilmington, Del.
Halafax Explosives Co., Los Angeles, Calif.
Hercules Powder Co., Wilmington, Del.— —13
Illinois Powder Mfg. Co., St. Louis, Mo.

CARS

Atlas Car & Mfg. Co., Cleveland, O.
Austin-Western Road Machinery Co., Aurora, Ill.—9
Bartlett & Snow Co., Cleveland, O.—107
Besser Mfg. Co., Alpena, Mich.—111
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Co. (U. S. Steel Subsidiary), Pittsburgh, Pa.—43
Chase Foundry & Mfg. Co., Columbus, O. —114
Eagle Iron Works, Des Moines, Ia.—134
Easton Car & Construction Co., Easton, Pa. —135
Koppel Industrial Car & Equip. Co., Pittsburgh, Pa.
Miles Mfg. Co., The, Jackson, Mich.
Multiplex Concrete Machinery Co., Elmore, O.—115
National Malleable & Steel Casting Co., Cleveland, O.
Ottumwa Iron Works, Ottumwa, Ia.
Riddell, W. A., Corp., Bucyrus, O.
Stearns Mfg. Co., Adrian, Mich.—108

CARS (Dump)

Atlas Car & Mfg. Co., Cleveland, O.
Austin-Western Road Machinery Co., Aurora, Ill.—9
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh, Pa.—43
Chase Foundry & Mfg. Co., Columbus, O. —114
Eagle Iron Works, Des Moines, Ia.—134
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Koppel Industrial Car & Equip. Co., Pittsburgh, Pa.
Link-Belt Co., Chicago, Ill.—1
National Malleable & Steel Casting Co., Cleveland, O.
Ottumwa Iron Works, Ottumwa, Ia.
Pressed Steel Car Co., Pittsburgh, Pa.
Richardson Scale Co., Clifton, N. J.—149
Traylor Engr. & Mfg. Co., Allentown, Pa. —7

CASTINGS

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Alloy Cast Steel Co., Marion, O.
American Manganese Steel Co., Chicago Heights, Ill.—46
Babcock & Wilcox Co., New York, N. Y.— 167
Bacon, Earle C., Inc., New York, N. Y.— 118
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.—45
Blaw-Knox Co., Pittsburgh, Pa.—131
Buchanan, C. G., Co., Inc., New York, N. Y. —45
Cement Mill Equipment Co., Detroit, Mich.
Chain Belt Co., Milwaukee, Wis.
Chicago Steel Foundry Co., Chicago, Ill. —123
Clyde Iron Works, Inc., Duluth, Minn.
Commercial Steel Co., Marion, O.
Continental Motors Corp., Detroit, Mich.
Dake Engine Co., Grand Haven, Mich.
Diamond Iron Works, Inc., Minneapolis, Minn.
Dixie Machinery Mfg. Co., St. Louis, Mo. —120
Eagle Iron Works, Des Moines, Ia.—134
Falk Corp., Milwaukee, Wis.
Frog, Switch & Mfg. Co., Carlisle, Pa.
Hardinge Co., Inc., York, Pa.—47
Huron Industries, Inc., Alpena, Mich.—161
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Lima Locomotive Works, Inc., Lima, O.— 153
Link-Belt Co., Chicago, Ill.—1
McLanahan & Stone Corp., Hollidaysburg, Pa.—28
Manitowoc Engr. Works, Manitowoc, Wis. —30
National Bearing Metals Corp., St. Louis, Mo.
National Malleable & Steel Casting Co., Cleveland, O.
Oliver Machinery Co., Grand Rapids, Mich.
Pettibone-Mulliken Corp., Chicago, Ill.—24
Robins Conveying Belt Co., New York, N. Y.—159
Smidth, F. L., & Co., New York, N. Y.— Front Cover
Sprout, Waldron & Co., Muncy, Pa.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.—39
Timken Roller Bearing Co., The, Canton, O.—6
Traylor Engineering & Mfg. Co., Allentown, Pa.—7
Vulcan Iron Works, Wilkes-Barre, Pa.

CABLEWAY DRAGLINE EXCAVATORS (See Excavators)

CEMENT PLANTS (Contractors)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Erie Steel Const. Co., Erie, Pa.
Gruendler Crusher & Pulverizer Co., St. Louis, Mo.—163
Hardinge Co., Inc., York, Pa.—47
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Smidth, F. L., & Co., New York, N. Y.— Front Cover
Traylor Engr. & Mfg. Co., Allentown, Pa. —7

CEMENT PROCESS

Cement Process Corp., Mexico City, Mexico —165

CENTRAL MIXING PLANTS

Blaw-Knox Company, Pittsburgh, Pa.—131
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Butler Bin Co., Waukesha, Wis.—22
Chain Belt Company, Milwaukee, Wis.
Erie Steel Construction Co., Erie, Pa.
Jaeger Machine Co., Columbus, O.—15
Stephens-Adamson Mfg. Co., Aurora, Ill. —124

CHAIN

Bacon, Earle C., Inc., New York, N. Y.— 118
Bartlett & Snow Co., Cleveland, O.—107
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Chain Belt Co., Milwaukee, Wis.
Fairfield Engr. Co., Marion, O.
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Link-Belt Co., Chicago, Ill.—1
Pettibone-Mulliken Co., Chicago, Ill.—24
Stephens-Adamson Mfg. Co., Aurora, Ill. —124
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.—39

CHAIN (Conveyor & Elevator)

American Manganese Steel Co., Chicago Heights, Ill.—46
Bacon, Earle C., Inc., New York, N. Y.— 118
Chain Belt Co., Milwaukee, Wis.
Fairfield Engineering Co., Marion, O.
Good Roads Machinery Corp., Kennett Square, Pa.
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Jeffrey Mfg. Co., The, Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Link-Belt Co., Chicago, Ill.—1
Pettibone-Mulliken Co., Chicago, Ill.—24
Portable Machinery Corp., York, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill. —124
Union Chain & Mfg. Co., The, Sandusky, O.

CHAIN (Dredge & Shovel)

Bucyrus-Erie Co., South Milwaukee, Wis. —Outside Back Cover
Jeffrey Mfg. Co., The, Columbus, O.—132
Link-Belt Co., Chicago, Ill.—1
Manganese Steel Forge Co., Inc., Philadelphia, Pa.
National Malleable & Steel Casting Co., Cleveland, O.
Pettibone-Mulliken Corp., Chicago, Ill.—24

CHANNELING MACHINES

Ingersoll-Rand Co., New York, N. Y.—21
Sullivan Machinery Co., Chicago, Ill.

CHUTES

Advance Foundry Co., Dayton, O.
Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
American Manganese Steel Co., Chicago Heights, Ill.—46
Atlas Car & Mfg. Co., Cleveland, O.
Austin-Western Rd. Machy Co., Aurora, Ill.—9
Bacon, Earle C., Inc., New York, N. Y.— 118
Blaw-Knox Co., Pittsburgh, Pa.—131
Chain Belt Co., Milwaukee, Wis.
Chicago Bridge & Iron Co., Chicago, Ill. —121
Cross Engineering Co., Carbondale, Pa.— 155
Eagle Iron Works, Des Moines, Ia.—134
Erie Steel Constr. Co., Erie, Pa.
Fairfield Engineering Co., Marion, O.
Good Roads Machinery Co.p., Kennett Square, Pa.
Gruendler Crusher & Pulverizer Co., St. Louis, Mo.—163
Hardinge Co., Inc., York, Pa.—47
Hendrick Mfg. Co., Carbondale, Pa.—153
Interstate Equipment Corp., Elizabeth, N. J.
Jaeger Machine Co., Columbus, O.—15
Jeffrey Mfg. Co., Columbus, O.—132
Johnson, C. S., Co., Champaign, Ill.
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Link-Belt Co., Chicago, Ill.—1
McLanahan & Stone Corp., Hollidaysburg, Pa.—28
Manganese Steel Forge Co., Inc., Philadelphia, Pa.
Northern Blower Co., Cleveland, O.
Parsons Engr. Corp., Cleveland, O.
Pioneer Engr. Wks., Minneapolis, Minn. —14
Ransome Concrete Machy., Minneapolis, Minn.
Richardson Scale Co., Clifton, N. J.—149
Robins Conveying Belt Co., New York, N. Y.—159
Ross Screen & Feeder Co., New York, N. Y. —130
Smidth, F. L., & Co., New York, N. Y.— Front Cover
Sprout, Waldron & Co., Muncy, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill. —124
Traylor Engr. & Mfg. Co., Allentown, Pa. —7

CIRCUIT BREAKERS

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
General Electric Co., Schenectndy, N. Y. —26, 27
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CIRCUIT TESTERS

General Electric Co., Schenectndy, N. Y. —26, 27
Hercules Powder Co., Wilmington, Del. —13
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CLARIFIERS

Dorr Co., Inc., The, New York, N. Y.
Hardinge Co., Inc., York, Pa.—47
Jeffrey Mfg. Co., The, Columbus, O.—132
Link-Belt Co., Chicago, Ill.—1
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

CLASSIFIERS

Allen Cone & Machinery Co., New York, N. Y.—136
Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
American Blower Corp., Detroit, Mich.
American Foundry Equipment Co., Mishawaka, Ind.
Bendelari, F. N., Joplin, Mo.
Blaw-Knox Co., Pittsburgh, Pa.—131
Colorado Iron Works Co., Denver, Colo.
Deister Concentrator Co., Fort Wayne, Ind.
Dorr Co., Inc., The, New York, N. Y.
Eagle Iron Works, Des Moines, Ia.—131
Hardinge Co., Inc., York, Pa.—47
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.

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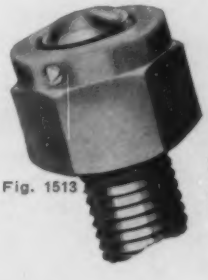

Fig. 1513

Pat'd. and Pat's. Pending.

DIRECTORY OF MANUFACTURERS' PRODUCTS—*Continued*

Knickerbocker Co., The, Jackson, Mich.
Link-Belt Company, Chicago, Ill.—1
Nordberg Mfg. Co., Milwaukee, Wis.—151
Northern Blower Co., Cleveland, O.
Pangborn Corp., Hagerstown, Md.
Parsons Engineering Corp., Cleveland, O.
Pioneer Engineering Works, Inc., Minneapolis, Minn.—14
Raymond Pulv. Div., Chicago, Ill.—29
Research Corp., New York, N. Y.
Sly, W. W., Mfg. Co., Cleveland, O.—38
Smidth, F. L., & Co., New York, N. Y.—Front Cover
Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Straub Mfg. Co., Inc., Oakland, Calif.
Traylor Engr. & Mfg. Co., Allentown, Pa.—7
Universal Vibrating Screen Co., Racine, Wis.—122
Western Precipitation Corp., Los Angeles, Calif.—161
Williams Patent Crusher & Pulv. Co., St. Louis, Mo.—32

CLEANING MACHINES (Bag)

Handy Sack Cleaner Co., Marion, Ia.
Link-Belt Co., Chicago, Ill.—1
Northern Blower Co., Cleveland, O.
Parsons Engr. Corp., Cleveland, O.
Stearns Mfg. Co., Adrian, Mich.—108

CLIPS (Wire Rope)

American Cable Co., New York, N. Y.—Inside Back Cover
American Hoist & Derrick Co., St. Paul, Minn.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland, O.
Broderick & Bascom Rope Co., St. Louis, Mo. (Yellow Strand)—18
Hazard Wire Rope Co., Wilkes-Barre, Pa.
Interstate Equipment Co., Elizabeth, N. J.
Leschen, A., & Sons Rope Co., St. Louis, Mo.—119
Macwhyte Company, Kenosha, Wis.—11
Roebling's, John A., Sons Co., Trenton, N. J.—137
Wickwire-Spencer Steel Co., New York, N. Y.—173

CLUTCHES

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
Dings Magnetic Separator Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago, Ill.
Jones, W. A., Foundry & Machine Co., Chicago, Ill.
Link-Belt Company, Chicago, Ill.—1
Sprout-Waldron & Co., Muncy, Pa.
Stearns Magnetic Mfg. Co., Milwaukee, Wis.
Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Wood's, T. B., Son Co., Chambersburg, Pa.

COLLARS (Shaft)

Link-Belt Company, Chicago, Ill.—1
Standard Pressed Steel Co., Jenkintown, Pa.—143

COLORS (Cement)

Harshaw Chemical Co., The, Cleveland, O.
Mepham, Geo. S., Corp., East St. Louis, Ill.—110
Ranetite Mfg. Co., Inc., Chicago, Ill.
Ricketson Mineral Color Works, Milwaukee, Wis.
Tamms Silica Co., Chicago, Ill.—110

COLORS (Mortar)

Mepham, Geo. S., Corp., East St. Louis, Ill.—110
Tamms Silica Co., Chicago, Ill.—110

CONCENTRATORS

Deister Concentrator Co., Fort Wayne, Ind.
Deister Machine Co., Fort Wayne, Ind.
Dings Magnetic Separator Co., Milwaukee, Wis.
Dorr Co., Inc., The, New York, N. Y.
Ritter Products Corp., Rochester, N. Y.
Straub Mfg. Co., Inc., Oakland, Calif.

CONTROL SYSTEMS (Temperature, Pressure)

Bailey Meter Co., Cleveland, O.
Leeds & Northrup Co., Philadelphia, Pa.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

CONTROLLERS (Electric)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
Fairbanks, Morse & Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.—26, 27
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

CONVERTERS (Electric)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
Century Electric Co., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.—26, 27
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

CONVEYORS (Apron)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
Barber-Greene Co., Aurora, Ill.
Bartlett & Snow Co., Cleveland, O.—167
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Chain Belt Co., Milwaukee, Wis.
Fairfield Engr. Co., Marion, O.
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Korb-Pettit Wire Fabrics & Iron Wks., Inc., Philadelphia, Pa.
Link-Belt Co., Chicago, Ill.—1
Robins Conveying Belt Co., New York, N. Y.—159
Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Traylor Engr. & Mfg. Co., Allentown, Pa.—7
Union Chain & Mfg. Co., The, Sandusky, O.
Wickwire-Spencer Steel Co., New York, N. Y.—173

CONVEYORS (Belt)

Allen-Sherman-Hoff Co., Philadelphia, Pa.—Inside Front Cover
Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
Austin-Western Road Machy. Co., Aurora, Ill.—9
Bacon, Earle C., Inc., New York, N. Y.—118
Barber-Greene Co., Aurora, Ill.
Bartlett & Snow Co., Cleveland, O.—167
Besser Mfg. Co., Alpena, Mich.—111
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Cement Mill Equipment Co., Detroit, Mich.
Chain Belt Co., Milwaukee, Wis.
Diamond Iron Works, Inc., Minneapolis, Minn.
Fairfield Engr. Co., Marion, O.
Fuller Co., Catasauqua, Pa.—147
Good Roads Machy. Corp., Kennett Square, Pa.
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Haiss, Geo., Mfg. Co., Inc., New York, N. Y.—123
Huron Industries, Inc., Alpena, Mich.—161
Industrial Brownhoist Corp., Cleveland, O.—157
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Korb-Pettit Wire Fabrics & Iron Works, Inc., Philadelphia, Pa.
Lewistown Foundry & Machine Co., Lewistown, Pa.—167
Link-Belt Company, Chicago, Ill.—1
McLanahan & Stone Corp, Hollidaysburg, Pa.—28
Multiplex Concrete Machinery Co., Elmore, O.—115
Neff & Fry Co., The, Camden, O.
New Holland Machine Co., New Holland, Pa.—167
Parsons Engr. Corp., Cleveland, O.
Pioneer Engineering Works, Inc., Minneapolis, Minn.—14
Portable Machinery Co., York, Pa.
Robins Conveying Belt Co., New York, N. Y.—159
Smidth, F. L., & Co., New York, N. Y.—Front Cover
Smith Engineering Works, Milwaukee, Wis.—23
Sprout, Waldron & Co., Inc., Muncy, Pa.
Stearns Mfg. Co., Adrian, Mich.—108
Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Sturtevant Mill Co., Boston, Mass.—40
Syntron Co., Homer City, Pa.
Toepfer, W., & Sons Co., Milwaukee, Wis.
Traylor Engineering & Mfg. Co., Allentown, Pa.—7
Universal Crusher Co., Cedar Rapids, Ia.
Universal Road Machinery Co., Kingston, N. Y.—16, 17
Vulcan Iron Works, Wilkes-Barre, Pa.
Webster Mfg. Co., Tiffin, O.—128
Wickwire-Spencer Steel Co., New York, N. Y.—173
Williams Patent Crusher & Pulv. Co., St. Louis, Mo.—32

CONVEYORS (Hydro-Vacuum)

Allen-Sherman-Hoff Co., Philadelphia, Pa.—Front Cover

CONVEYORS (Overhead)

Godfrey Conveyor Co., Elkhart, Ind.
Stephens-Adamson Mfg. Co., Aurora, Ill.—124

CONVEYORS (Pan)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Jeffrey Mfg. Co., Columbus, O.—132
Link-Belt Co., Chicago, Ill.—1

CONVEYORS (Pneumatic)

Chain Belt Co., Milwaukee, Wis.
Fuller Co., Catasauqua, Pa.—147
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Holly Pneumatic Systems, Inc., New York, N. Y.
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Northern Blower Co., Cleveland, O.
Parsons Engr. Corp., Cleveland, O.
Raymond Pulv. Div., Chicago, Ill.—29

CONVEYORS (Portable)

Austin-Western Road Machinery Co., Aurora, Ill.—9
Barber-Greene Co., Aurora, Ill.
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Brewer & Co., Tecumseh, Mich.
Chain Belt Co., Milwaukee, Wis.
Fairfield Engr. Co., Marion, O.
Fuller Co., Catasauqua, Pa.—147
Godfrey Conveyor Co., Elkhart, Ind.
Good Roads Machinery Corp., Kennett Square, Pa.
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Haiss, Geo., Mfg. Co., Inc., New York, N. Y.—123
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Link-Belt Co., Chicago, Ill.—1
Pioneer Engineering Works, Inc., Minneapolis, Minn.—14
Portable Machy. Co., York, Pa.
Robins Conveying Belt Co., New York, N. Y.—159
Stephens-Adamson Mfg. Co., Aurora, Ill.—124

CONVEYORS (Rotary)

Hardinge Co., Inc., York, Pa.—47
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.

CONVEYORS (Screw)

Bartlett & Snow Co., Cleveland, O.—167
Besser Mfg. Co., Alpena, Mich.—111
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Cement Mill Equipment Co., Detroit, Mich.
Chain Belt Co., Milwaukee, Wis.
Eagle Iron Works, Des Moines, Ia.—134
Fairfield Engr. Co., Marion, O.
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Hardinge Co., Inc., York, Pa.—47
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Link-Belt Co., Chicago, Ill.—1
Northern Blower Corp., Cleveland, O.
Sprout, Waldron & Co., Inc., Muncy, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill.—124

CONVEYORS (Trolley)

Chain Belt Co., Milwaukee, Wis.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Jeffrey Mfg. Co., Columbus, O.—132
Link-Belt Co., Chicago, Ill.—1
Stephens-Adamson Mfg. Co., Aurora, Ill.—124

CONVEYORS (Vibrating)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
Chain Belt Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Link-Belt Co., Chicago, Ill.—1
Smidth, F. L., & Co., New York, N. Y.—Front Cover
Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Syntron Co., Homer City, Pa.

CONVEYOWEIGHS

Richardson Scale Co., Clifton, N. Y.—149

COOLERS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
American Blower Co., Detroit, Mich.
Bartlett & Snow Co., Cleveland, O.—167
Blaw-Knox Company, Pittsburgh, Pa.—131
Hardinge Co., Inc., York, Pa.—47
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Lime & Hydrate Plants Co., York, Pa.
Link-Belt Co., Chicago, Ill.—1
Manitowoc Engr. Works, Manitowoc, Wis.—30
McGann Mfg. Co., Inc., York, Pa.
Northern Blower Co., Cleveland, O.
Smidth, F. L., & Co., New York, N. Y.—Front Cover
Traylor Engr. & Mfg. Co., Allentown, Pa.—7
Vulcan Iron Works, Wilkes-Barre, Pa.

CORRECTING BASINS

Smidth, F. L., & Co., New York, N. Y.—Front Cover

COUPLINGS (Flexible)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
Chain Belt Co., Milwaukee, Wis.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., The, Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, O.
Huron Industries, Inc., Alpena, Mich.—161
James, D. O., Mfg. Co., Chicago, Ill.
Jones, W. A., Foundry & Machine Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Link-Belt Co., Chicago, Ill.—1
Ottumwa Iron Works, Ottumwa, Ia.
Smith, T. L., Co., Milwaukee, Wis.
Standard Pressed Steel Co., Jenkintown, Pa.—143
Union Chain & Mfg. Co., The, Sandusky, O.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

COUPLINGS (Hose)

Boston Woven Hose & Rubber Co., Cambridge, Mass.
Chicago Pneumatic Tool Co., New York, N. Y.
Cleveland Rock Drill Co., The, Cleveland, O.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Goodrich, B. F., Co., Akron, O.—3, 176
Hewitt Rubber Corp., Buffalo, N. Y.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York, N. Y.—21
Manitowoc Engineering Works, Manitowoc, Wis.—30
New York Belting & Packing Co., New York, N. Y.
Republic Rubber Co., Youngstown, O.
Sullivan Machinery Co., Chicago, Ill.

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DIRECTORY OF MANUFACTURERS' PRODUCTS—*Continued*

U. S. Rubber Products, Inc., New York, N. Y.
Worthington Pump & Machy. Corp., Harrison, N. J.

COUPLINGS (Pipe)

Dresser, S. R., Mfg. Co., Bradford, Pa.
Goodrich, B. F., Co., Akron, O.—3, 176
Hewitt Rubber Corp., Buffalo, N. Y.
Ingersoll-Rand Co., New York, N. Y.—21
New York Belting & Packing Co., New York, N. Y.
Republic Rubber Co., Youngstown, O.
U. S. Rubber Products, Inc., New York, N. Y.

COUPLINGS (Shaft)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Chain Belt Co., Milwaukee, Wis.
Falk Corp., The, Milwaukee, Wis.
Huron Industries, Inc., Alpena, Mich.—161
James, D. O., Mfg. Co., Chicago, Ill.
Jones, W. A., Foundry & Machine Co., Chicago, Ill.
Link-Belt Company, Chicago, Ill.—1
Oliver Machinery Co., Grand Rapids, Mich.
Ottumwa Iron Works, Ottumwa, Ia.
Robins Conveying Belt Co., New York, N. Y.—159
Stephens-Adamson Mfg. Co., Aurora, Ill. —124
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Wood's, T. B., Sons & Co., Chambersburg, Pa.

CRANES

American Hoist & Derrick Co., St. Paul, Minn.
Atlas Car & Mfg. Co., Cleveland, O.
Austin-Western Road Machy. Co., The, Aurora, Ill.—9
Bay City Shovels, Inc., Bay City, Mich.—44
Browning Crane & Shovel Co., The, Cleveland, O.
Bucyrus-Erie Co., South Milwaukee, Wis. —Outside Back Cover
Byers Machine Co., Ravenna, O.
Clyde Iron Works, Inc., Duluth, Minn.
Erie Steel Construction Co., Erie, Pa.
General Excavator Co., Marion, O.
Harnischfeger Corp, Milwaukee, Wis.—10
Industrial Brownhoist Corp., Cleveland, O. —157
Koehring Co., Milwaukee, Wis.—37
Lima Locomotive Works (Shovel & Crane Div.), Lima, O.—25
Link-Belt Co., Chicago, Ill.—1
Manitowoc Engineering Works, Manitowoc, Wis.—30
Marion Steam Shovel Co., Marion, O.
Michigan Power Shovel Co., Benton Harbor, Mich.—155
Northwest Engineering Co., Chicago, Ill. —41
Ohio Locomotive Crane Co., The, Bucyrus, O.
Osgood Co., Marion, O.
Thew Shovel Co., The, Lorain, O.—19
Whiting Corp., Harvey, Ill.

CRANES (Overhead Traveling)

Cleveland Crane & Engineering Co., Wickliffe, O.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Erie Steel Constr. Co., Erie, Pa.
Harnischfeger Corp., Milwaukee, Wis.—10
Industrial Brownhoist Corp., Cleveland, O. —157
Whiting Corp., Harvey, Ill.

CRANES (Tractor)

Austin-Western Road Machinery Co., Aurora, Ill.—9
Bay City Shovels, Inc., Bay City, Mich.—44
Bucyrus-Erie Co., South Milwaukee, Wis. —Outside Back Cover
Harnischfeger Corp., Milwaukee, Wis.—10
Koehring Co., Milwaukee, Wis.—37
Lima Locomotive Works, Inc. (Shovel & Crane Div.), Lima, O.—25
Link-Belt Co., Chicago, Ill.—1

CRANES (Truck)

Atlas Car & Mfg. Co., Cleveland, O.
Bay City Shovels, Inc., Bay City, Mich.—44
Browning Crane & Shovel Co., The, Cleveland, O.
Harnischfeger Corp., Milwaukee, Wis.—10
Thew Shovel Co., The, Lorain, O.—19

CRAWLER ATTACHMENTS

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Bay City Shovels, Inc., Bay City, Mich.—44
Harnischfeger Corp., Milwaukee, Wis.—10
Link-Belt Co., Chicago, Ill.—1

CRUSHER PARTS

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Alloy Cast Steel Co., Marion, O.
American Manganese Steel Co., Chicago Heights, Ill.—46
American Pulverizer Co., St. Louis, Mo.—20
Bacon, Earle C., Inc., New York, N. Y.— 118
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.—45
Buchanan, C. G., Co., Inc., New York, N. Y. —45
Commercial Steel Casting Co., Marion, O.
Dixie Machinery Mfg. Co., St. Louis, Mo. —120
Eagle Iron Works, Des Moines, Ia.—134
Frog, Switch & Mfg. Co., The, Carlisle, Pa.
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
National Bearing Metals Corp., St. Louis, Mo.
Pennsylvania Crusher Co., Philadelphia, Pa.—5
Pioneer Engineering Works, Inc., Minneapolis, Minn.—14
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.—39
Traylor Engineering Mfg. Co., Allentown, Pa.—7

(CRUSHERS (Coal)

Austin-Western Road Machinery Co., Aurora, Ill.—9
Jeffrey Mfg. Co., Columbus, O.—132
Link-Belt Co., Chicago, Ill.—1
McLanahan & Stone Corp., Hollidaysburg, Pa.—28
Pennsylvania Crusher Co., Philadelphia, Pa.—5
Stephens-Adamson Mfg. Co., Aurora, Ill. —124
Williams Patent Crusher & Pulv. Co., St. Louis, Mo.—32

CRUSHERS (Gyratory)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Austin-Western Road Machinery Co., Aurora, Ill.—9
Bacon, Earle C., Inc., New York, N. Y.— 118
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.—45
Buchanan, C. G., Co., Inc., New York, N. Y. —45
Diamond Iron Works, Inc., Minneapolis, Minn.
Gruendler Crusher & Pulverizer Co., St. Louis, Mo.—163
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
New Holland Machine Co., New Holland, Pa.—167
Nordberg Mfg. Co., Milwaukee, Wis.—151
Pennsylvania Crusher Co., Philadelphia, Pa.—5
Pioneer Engineering Works, Inc., Minneapolis, Minn.—14
Smith Engineering Works, Milwaukee, Wis.—23
Traylor Engineering & Mfg. Co., Allentown, Pa.—7
Universal Road Machinery Co., Kingston, N. Y.—16, 17
Williams Patent Crusher & Pulv. Co., St. Louis, Mo.—32

CRUSHERS (Jaw)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Austin-Western Road Machinery Co., Aurora, Ill.—9
Bacon, Earle C., Inc., New York, N. Y.— 118
Birdsboro Steel Foundry Machine Co., Birdsboro, Pa.—45
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Buchanan, C. G., Co., Inc., New York, N. Y. —45
Diamond Iron Works, Inc., Minneapolis, Minn.
Dixie Machinery Mfg. Co., St. Louis, Mo. —120
Good Roads Machinery Corp., Kennett Square, Pa.
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Hardinge Co., Inc., York, Pa.—47
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Lewistown Foundry & Machine Co., Lewistown, Pa.—167
New Holland Machine Co., New Holland, Pa.—167
Nordberg Mfg. Co., Milwaukee, Wis.—151
Pennsylvania Crusher Co., Philadelphia, Pa.—5
Pioneer Engineering Works, Inc., Minneapolis, Minn.—14
Smith Engineering Works, Milwaukee, Wis.—23
Traylor Engineering & Mfg. Co., Allentown, Pa.—7
Universal Crusher Co., Cedar Rapids, Ia.
Universal Road Machinery Co., Kingston, N. Y.—16, 17
Williams Patent Crusher & Pulv. Co., St. Louis, Mo.—32

CRUSHERS (Laboratory)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
American Pulverizer Co., St. Louis, Mo.— 20
Bacon, Earle C., Inc., New York, N. Y.— 118
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.—45
Buchanan, C. G., Co., Inc., New York, N. Y. —45
Dixie Machinery Mfg. Co., St. Louis, Mo. —120
Gruendler Crusher & Pulverizer Co., St. Louis, Mo.—163
Hardinge Co., Inc., York, Pa.—47
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Pennsylvania Crusher Co., Philadelphia, Pa.—5
Sturtevant Mill Co., Boston, Mass.—40
Traylor Engineering & Mfg. Co., Allentown, Pa.—7
Williams Patent Crusher & Pulv. Co., St. Louis, Mo.—32

CRUSHERS (Primary Breakers)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Smith Engr. Works, Milwaukee, Wis.—23
Traylor Engineering & Mfg. Co., Allentown, Pa.—7
Williams Patent Crusher & Pulv. Co., St. Louis, Mo.—32

CRUSHERS (Reduction)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Austin-Western Rd. Machy. Co., Aurora, Ill.—9
Bacon, Earle C., Inc., New York, N. Y.— 118
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.—45
Buchanan, C. G., Co., Inc., New York, N. Y.—45
Jeffrey Mfg. Co., Columbus, O.—132
Smith Engr. Works, Milwaukee, Wis.—23
Traylor Engineering & Mfg. Co., Allentown, Pa.—7

CRUSHERS (Ring)

American Pulverizer Co., St. Louis, Mo.— 20
Dixie Machy. Mfg. Co., St. Louis, Mo.—120
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Hardinge Co., Inc., York, Pa.—47
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Williams Patent Crusher & Pulv. Co., St. Louis, Mo.—32

CRUSHERS (Roll)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
American Pulverizer Co., St. Louis, Mo. —20
Austin-Western Road Machinery Co., Aurora, Ill.—9
Bacon, Earle C., Inc., New York, N. Y.— 118
Bartlett & Snow Co., Cleveland, O.—107
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Birdsboro Steel Foundry & Machinery Co., Birdsboro, Pa.—45
Brewer, H., & Co., Tecumseh, Mich.
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Diamond Iron Works, Inc., Minneapolis, Minn.
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Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
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Robins Conveying Belt Co., New York, N. Y.—159
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Traylor Engineering & Mfg. Co., Allentown, Pa.—7
Vulcan Iron Works, Wilkes-Barre, Pa.
Williams Patent Crusher & Pulv. Co., St. Louis, Mo.—32

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Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
American Pulv. Co., St. Louis, Mo.—20
Austin-Western Road Mchy. Co., Aurora, Ill.—9
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Barber-Greene Co., Aurora, Ill.
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.—45
Blaw-Knox Co., Pittsburgh, Pa.—131
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Buchanan, C. G., Co., Inc., New York, N. Y.—45
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Diamond Iron Works, Inc., Minneapolis, Minn.
Dixie Machy. Mfg. Co., St. Louis, Mo.—120
Eagle Iron Works, Des Moines, Ia.—134
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Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Heltzel Steel Form & Iron Co., Warren, O.
Jeffrey Mfg. Co., Columbus, O.—132

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Superior Body Co., Inc., Marion, Ind.
Whiting Corp., Harvey, Ill.

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Alemite Corp. Chicago, Ill.
Link-Belt Co., Chicago, Ill.—1
Lonkenheimer Co., Cincinnati, O.
Robins Conveying Belt Co., New York, N. Y.—159
Wood's, T. B., Sons Co., Chambersburg, Pa.

CUTTER HEADS (Dredge)

Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.—45
Buchanan Co., Inc., C. G., New York, N. Y.—45
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Porter, H. K., Inc., Everett, Mass.

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Harnischfeger Corporation, Milwaukee, Wis.—10
Hayward Company, New York, N. Y.—165
Manitowoc Engr. Works, Manitowoc, Wis.—30
Wellman Engr. Co. (G. H. Williams), Cleveland, O.

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Burton Explosives, Inc., Cleveland, O.
du Pont de Nemours, E. I., & Co., Wilmington, Del.
Ensign-Bickford Co., Simsbury, Conn.—33
Halafax Explosives Co., Los Angeles, Calif.
Hercules Powder Co., Wilmington, Del.—13
Illinois Powder Mfg. Co., St. Louis, Mo.

DEWATERERS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
Chain Belt Co., Milwaukee, Wis.
Deister Concentrator Co., Fort Wayne, Ind.
Dorr Company, Inc., New York, N. Y.
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Hardinge Co., Inc., York, Pa.—47
Jaeger Machine Co., Columbus, O.—15
Jeffrey Mfg. Co., Columbus, O.—132
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Goodrich, B. F., Co., Akron, O.—3, 176
Jaeger Machine Co., Columbus, O.—15
Manhattan Rubber Mfg. Divn., Passaic, N. J.
Quaker City Rubber Co., Philadelphia, Pa.

DIPPER TEETH

American Manganese Steel Co., Chicago Heights, Ill.—46
Birdsboro Steel Foundry & Mach. Co., Birdsboro, Pa.—45
Buchanan, C. G., Co., Inc., New York, N. Y.—45
Bucyrus-Erie Co., South Milwaukee, Wis.—Outside Back Cover
Frog, Switch & Mfg. Co., Carlisle, Pa.
General Excavator Co., Marion, O.
Harnischfeger Corp., Milwaukee, Wis.—10
Marion Steam Shovel Co., Marion, O.
Osgood Co., Marion, O.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.—39
Thew Shovel Co., Lorain, O.—19

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General Excavator Co., Marion, O.
Harnischfeger Corp., Milwaukee, Wis.—10
Link-Belt Co., Chicago, Ill.—1
Marion Steam Shovel Co., Marion, O.
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Bucyrus-Erie Co., South Milwaukee, Wis.—Outside Back Cover
Harnischfeger Corp., Milwaukee, Wis.—10

DRAGLINES

American Hoist & Derrick Co., St. Paul, Minn.
Austin-Western Road Machy. Co., Aurora, Ill.—9
Bay City Shovels, Inc., Bay City, Mich.—44
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Osgood Co., Marion, O.
Straub Mfg. Co., Inc., Oakland, Calif.
Welch, F. M., Engr. Service, Greenville, O.

DRILL STEEL

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., New York, N. Y.
Cleveland Rock Drill Co., Cleveland, O.
Gardner-Denver Co., Quincy, Ill.
Hardsocg Wonder Drill Co., Ottumwa, Ia.
Indepen-dent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York, N. Y.—21
Sullivan Machy. Co., Chicago, Ill.
Worthington Pump & Machy. Corp., Harrison, N. J.

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Hardsocg Wonder Drill Co., Ottumwa, Ia.
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Sanderson Cyclone Drill Co., Orrville, O.
Star Drilling Machine Co., Akron, O.

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Cleveland Rock Drill Co., Cleveland, O.
Cochise Rock Drill Mfg. Co. Los Angeles, Calif.
Gardner-Denver Co., Quincy, Ill.
Hardsocg Wonder Drill Co., Ottumwa, Ia.
Independent Pneumatic Tool Co., Chicago, Ill.
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Keystone Driller Co., Beaver Falls, Pa.
Loomis Machine Co., Tiffin, O.
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Schramm, Inc., West Chester, Pa.
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Sullivan Machy. Co., Chicago, Ill.
Syntron Co., Homer City, Pa.
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Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
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DRIVES (Short-center)

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Bacon, Earle C., Inc., New York, N. Y.—118
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Fairbanks, Morse & Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.—1
Rockwood Mfg. Co., Indianapolis, Ind.
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Sprout, Waldron & Co., Inc., Muncy, Pa.

DRIVES (Worm)

Cleveland Worm & Gear Co., Cleveland, O.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Link-Belt Co., Chicago, Ill.—1
Gears & Forgings Inc., Cleveland, O.
James, D. O., Mfg. Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.—1
National Bearing Metals Corp., St. Louis, Mo.

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Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
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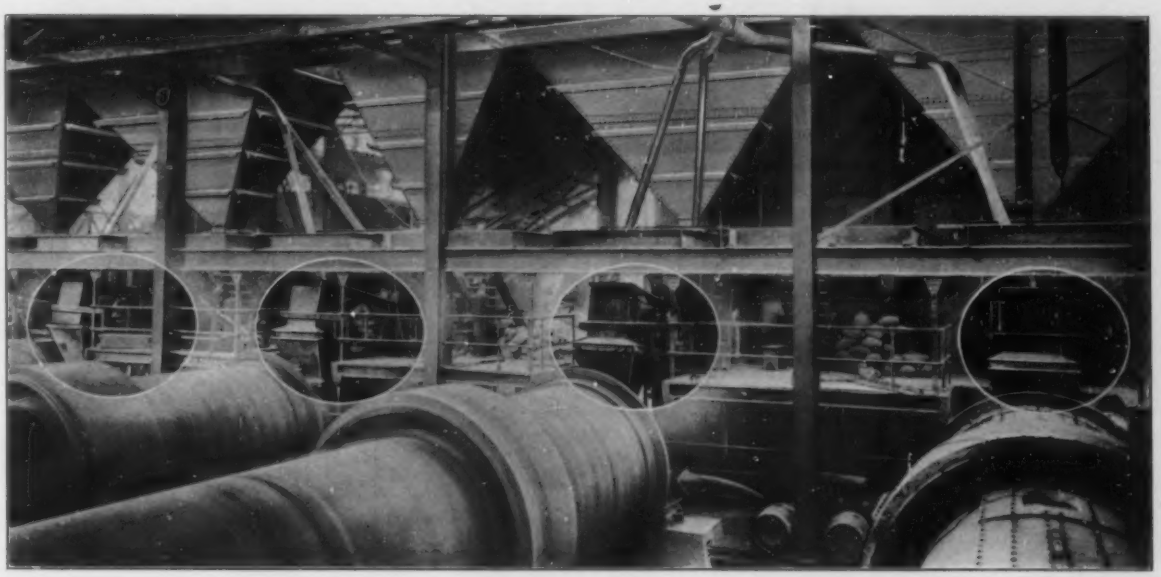

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ELECTRODES (Welding)

American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland, O.
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Stephens-Adamson Mfg. Co., Aurora, Ill.—124
Sturtevant Mill Co., Boston, Mass.—40
Traylor Eng. & Mfg. Co., Allentown, Pa.—7
Webster Mfg. Co., Tiffin, O.—128
Welch, F. M., Eng. Service, Greenville, O.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Williams Patent Crusher & Pulv. Co., St. Louis, Mo.—32
Wood, R. D. & Company, Philadelphia, Pa.

ENGINES (Diesel)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
Ball-Murcie Engine Co., Muncie, Ind.
Chicago Pneumatic Tool Co., New York, N. Y.
Cooper-Bessemer Corp., Mt. Vernon, O.
Fairbanks, Morse & Co., Chicago, Ill.
Hercules Motors Corp., Canton, O.
Ingersoll-Rand Co., New York, N. Y.—21
Murphy Diesel Co., Ltd., Milwaukee, Wis.
National Supply Co., Toledo, O.—133
Nordberg Mfg. Co., Milwaukee, Wis.—159
Power Mfg. Co., Marion, O.
Worthington Pump & Mchy. Corp., Harrison, N. J.

ENGINES (Gasoline)

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American Hoist & Derrick Co., St. Paul, Minn.
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Climax Eng. Co., Chicago, Ill.
Continental Motors Corp., Detroit, Mich.
Cooper-Bessemer Corp., Mt. Vernon, O.
Fairbanks, Morse & Co. Chicago, Ill.
Hercules Motors Corp., Canton, O.
Ingersoll-Rand Co., New York, N. Y.—21
LeRoi Co., Milwaukee, Wis.
New Holland Machine Co., New Holland, Pa.—167
Novo Eng. Co., Lansing, Mich.
Orr & Sembower, Inc., Reading, Pa.
Power Mfg. Co., Marion, O.
Wilson, K. R. Buffalo, N. Y.
Wisconsin Motor Corp., Milwaukee, Wis.
Worthington Pump & Mchy. Corp., Harrison, N. J.

ENGINES (Kerosene)

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Fairbanks, Morse & Co., Chicago, Ill.
Hercules Motors Corp., Canton, O.
New Holland Machine Co., New Holland, Pa.—167
Power Mfg. Co., Marion, O.
Wisconsin Motor Corp., Milwaukee, Wis.

ENGINES (Oil)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
American Hoist & Derrick Co., St. Paul, Minn.
Chicago Pneumatic Tool Co., New York, N. Y.
Continental Motors Corp., Detroit, Mich.
Cooper-Bessemer Corp., Mt. Vernon, O.
Fairbanks, Morse & Co., Chicago, Ill.
Hercules Motors Corp., Canton, O.
Ingersoll-Rand Co., New York, N. Y.—21
New Holland Machine Co., New Holland, Pa.—167
Power Mfg. Co., Marion, O.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wisconsin Motor Corp., Milwaukee, Wis.

ENGINES (Steam)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—129
American Blower Corp., Detroit, Mich.
American Hoist & Derrick Co., St. Paul, Minn.
Dake Engine Co., Grand Haven, Mich.
Morris Machine Works, Baldwinsville, N. Y.—174
Nordberg Mfg. Co., Milwaukee, Wis.—151
Troy Engine & Machine Co., Troy, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

EXCAVATORS (Cableway Dragline)

American Cable Co., New York, N. Y.—Inside Back Cover
American Hoist & Derrick Co., St. Paul, Minn.
Austin-Western Road Mchy. Co., Aurora, Ill.—9
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Blaw-Knox Co., Pittsburgh, Pa.—131
Bucyrus-Erie Co., South Milwaukee, Wis.—Outside Back Cover
Erie Steel Const. Co., Erie, Pa.
General Excavator Co., Marion, O.
Harnischfeger Corp., Milwaukee, Wis.—10
Hazard Wire Rope Co., Wilkes-Barre, Pa.
Interstate Equip. Corp., Elizabeth, N. Y.
Koehring Co., Milwaukee, Wis.—37
Lima Locomotive Works, Inc. (Shovel & Crane Divn.), Lima, O.—25
Link-Belt Co., Chicago, Ill.—1
Marion Steam Shovel Co., Marion, O.
Michigan Power Shovel Co., Benton Harbor, Mich.—155
Northwest Eng. Co., Chicago, Ill.—41
Osgood Company, Marion, O.
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Sauerman Bros., Chicago, Ill.—159
Thew Shovel Co., Lorain, O.—19
Wickwire-Spencer Steel Co., New York, N. Y.—173

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Koehring Co., Milwaukee, Wis.—37
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Link-Belt Co., Chicago, Ill.—1

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Thew Shovel Co., Lorain, O.—19

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Thew Shovel Co., Lorain, O.—19

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du Pont de Nemours, E. I., & Co., Wilmington, Del.
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Illinois Powder Mfg. Co., St. Louis, Mo.
Independent Explosives Co., Cleveland, O.

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Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Northern Blower Co., Cleveland, O.
Pangborn Corp., Hagerstown, Md.
Parsons Engr. Corp., Cleveland, O.
Sly, W. W., Mfg. Co., Cleveland, O.—38
Smidth, F. L., & Co., New York, N. Y.—Front Cover
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Talcott, W. O. & M. W., Inc., Providence, R. I.
Victor Balata & Textile Belting Co., New York, N. Y.

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Bartlett, C. O., & Snow Co., Cleveland, O.—167
Besser Mfg. Co., Alpena, Mich.—111
Blaw-Knox Co., Pittsburgh, Pa.—131
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Brewer, H., & Co., Tecumseh, Mich.
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Deister Concentrator Co., Fort Wayne, Ind.
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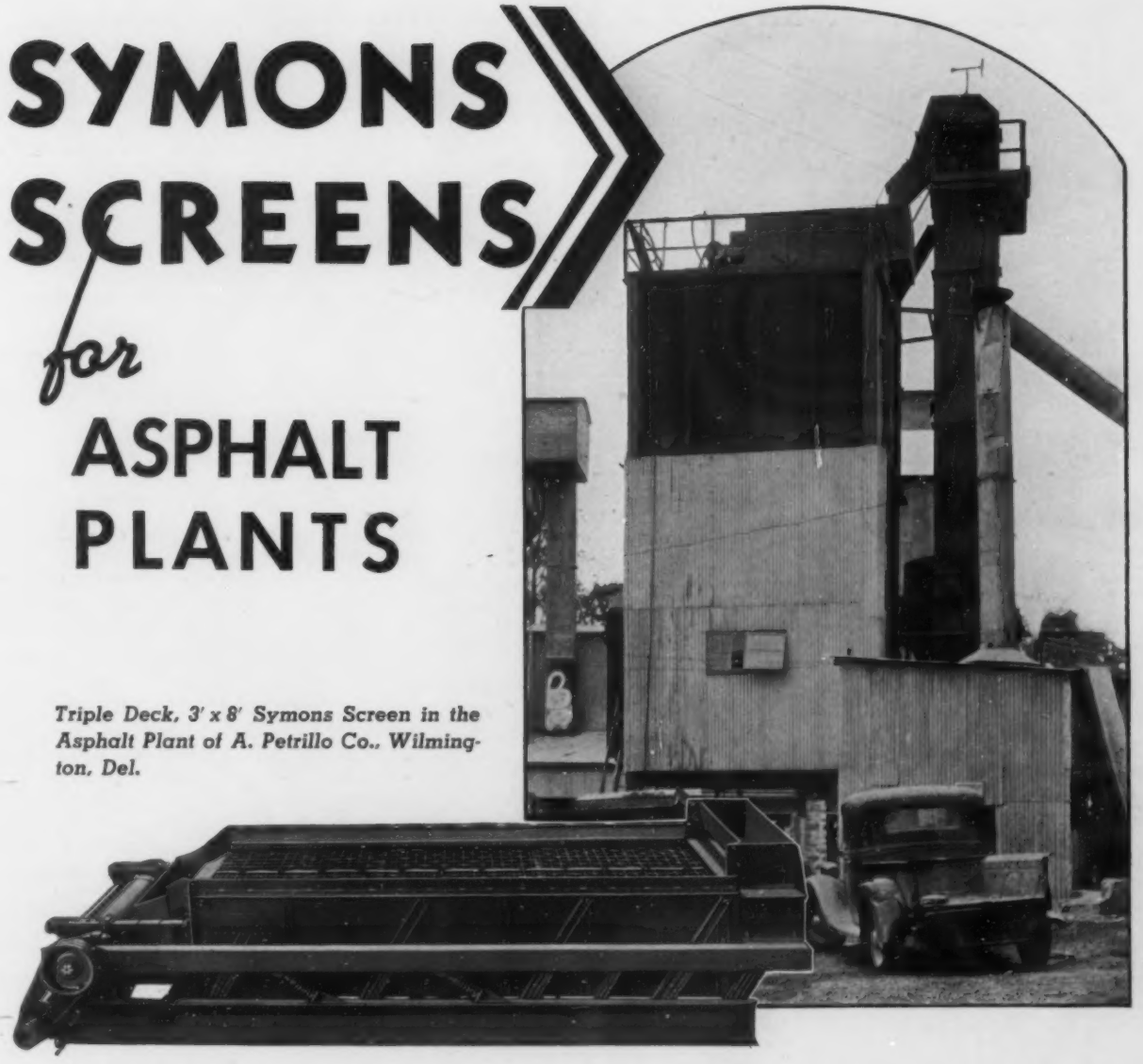

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Huron Industries Co., Alpena, Mich.—161
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Link-Belt Co., Chicago, Ill.—1
Miles Mfg. Co., Jackson, Mich.
Northern Blower Co., Cleveland, O.
Pennsylvania Crusher Co., Philadelphia, Pa.—3
Pioneer Eng. Wks., Inc., Minneapolis, Minn.—14
Richardson Scale Co., Clifton, N. J.—149
Riddell, W. A., Corp., Bucyrus, O.
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Traylor Eng. & Mfg. Co., Allentown, Pa.—7
Universal Road Mchy. Co., Kingston, N. Y. —16, 17
Webster Mfg. Co., Tiffin, O.—128.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

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Roebling's, John A., Sons Co., Trenton, N. J.—137
Wickwire Spencer Steel Co., New York, N. J.—173

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Northern Blower Co., Cleveland, O.
Oliver United Filters, Inc., New York, N. Y.
Roebling's, John A., Sons Co., Trenton, N. J.—137
Tyler, W. S., Co., Cleveland, O.—159
Wickwire Spencer Steel Co., New York, N. J.—173

FILTERS

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Alemite Corp, Chicago, Ill.
American Blower Corp., Detroit, Mich.
American Foundry Equip. Co., Mishawaka, Ind.
Binks Mfg. Co., Chicago, Ill.
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Gallgher Co., Salt Lake City, U.
Hardinge Co., Inc., York, Pa.—47
Holly Pneumatic Systems, Inc., New York, N. Y.
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Northern Blower Co., Cleveland, O.
Oliver United Filters, Inc., New York, N. Y.
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Parsons Eng. Corp., Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.—137
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Staynew Filter Corp., Rochester, N. Y.
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(See Refractories)

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Ensign-Bickford Co., Simsbury, Conn.—33
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Hercules Powder Co., Wilmington, Del. —13

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Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

GALVANOMETERS

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Hercules Powder Co., Wilmington, Del. —13
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

GASKETS

Cincinnati Rubber Mfg. Co., Cincinnati, O.
Goodrich, B. F. Co., Akron, O.—3, 176
Goodyear Tire & Rubber Co., Inc., Akron, O.—125
Hewitt Rubber Corp., Buffalo, N. Y.
Independent Pneumatic Tool Co., Chicago, Ill.
Keasbey & Mattison Co., San Francisco, Calif.
Manhattan Rubber Mfg. Co., Passaic, N. J.
National Bearing Metals Corp., St. Louis, Mo.
New York Belting & Packing Co., New York, N. Y.
Quaker City Rubber Co., Philadelphia, Pa.
Republic Rubber Co., Youngstown, O.
United States Rubber Products, Inc., New York, N. Y.

GASOLINE

Gulf Refining Co., Pittsburgh, Pa.—139
Socony-Vacuum Oil Co., Inc., New York, N. Y.
Standard Oil Co., Chicago, Ill.
Texas Co., New York, N. Y.—4

GEAR REDUCERS

Cleveland Worm & Gear Co., Cleveland, O.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, O.
Huron Industries, Inc., Alpena, Mich.—161
James, D. O., Mfg. Co., Chicago, Ill.
Jones, W. A., Foundry & Mach. Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.—1
Ottumwa Iron Works, Ottumwa, Ia.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

GEARS

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Bacon, Earle C., Inc., New York, N. Y. —118
Bartlett, C. O., & Snow Co., Cleveland, O. —167
Birdsboro Steel Foundry & Mach. Co., Birdsboro, Pa.—45
Bodinson Mfg. Co., Inc., San Francisco, Calif.
Buchanan, C. G., Co., Inc., New York, N. Y.—45
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Falk Corp., Milwaukee, Wis.
Frog, Switch & Mfg. Co., Carlisle, Pa.
Gears & Forgings, Inc., Cleveland, O.
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Huron Industries, Inc., Alpena, Mich.—161
James, D. O., Mfg. Co., Chicago, Ill.
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GENERATORS (Electric)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
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Cooper-Bessemer Corp., Mt. Vernon, O.
Fairbanks, Morse & Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y. —26, 27
Harnischfeger Corp., Milwaukee, Wis.—10
Ingersoll-Rand Co., New York, N. Y.—21
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Murphy Diesel Co., Ltd., Milwaukee, Wis.
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Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wilson, K. B., Buffalo, N. Y.

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Wellman Engineering Co. (G. H. Williams), Cleveland, O.

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Gulf Refining Co., Pittsburgh, Pa.—139
Penola, Inc., Pittsburgh, Pa.
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Standard Oil Co., Chicago, Ill.
Texas Co., New York, N. Y.—4

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GUARDS (Machinery)

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National Wire Cloth Co., Inc., St. Paul, Minn.
Superior Body Co., Inc., Marion, Ind.
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Erie Steel Const. Co., Erie, Pa.
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Atlas Car & Mfg. Co., Cleveland, O.
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General Electric Co., Schenectady, N. Y. —26, 27
Jeffrey Mfg. Co., Columbus, O.—132
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
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General Elec. Co., Schenectady, N. Y.—26, 27
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HEATERS, ELECTRIC (Asphalt)

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HOISTS

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Sauerman Bros., Chicago, Ill.—159
Stearns Mfg. Co., Adrian, Mich.—108
Stephens-Adamson Mfg. Co., Aurora, Ill. —124
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Vulcan Iron Wks., Wilkes-Barre, Pa.
Webster Mfg. Co., Tiffin, O.—128

HOOKS (Wire Rope)

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Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Link-Belt Co., Chicago, Ill.—1
Manganese Steel Forge Co., Inc., Philadelphia, Pa.
Miles Mfg. Co., Jackson, Mich.
Parsons Engr. Corp., Cleveland, O.
Pioneer Engr. Wks., Inc., Minneapolis, Minn.—14
Portable Machy. Co., York, Pa.
Ransome Concrete Machinery Co., Dunellen, N. J.
Richardson Scale Co., Clifton, N. J.—149
Robins Conveying Belt Co., New York, N. Y.—159
Stephens-Adamson Mfg. Co., Aurora, Ill. —124
Superior Body Co., Marion, Ind.
Traylor Engineering & Mfg. Co., Allentown, Pa.—7
Universal Road Machinery Co., Kingston, N. Y.—16, 17
Webster Mfg. Co., Tiffin, O.—128

HOSE (Air Drill, Water, Steam, Sand Suction & Discharge)

Binks Mfg. Co., Chicago, Ill.
Boston Woven Hose & Rubber Co., Cambridge, Mass.
Chicago Pneumatic Tool Co., New York, N. Y.
Cincinnati Rubber Mfg. Co., Cincinnati, O.
Cleveland Rock Drill Co., Cleveland, O.
Firestone Tire & Rubber Co., Akron, O.
Goodrich, B. F., Co., Akron, O.—3-176
Goodyear Tire & Rubber Co., Inc., Akron, O.—125
Hardsocg Wonder Drill Co., Ottumwa, Ia.
Hetherington & Berner, Inc., Indianapolis, Ind.—165, 167
Dixie Machinery Mfg. Co., St. Louis, Mo.
Hewitt Rubber Corp., Buffalo, N. Y.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York, N. Y.—21
Jaeger Machine Co., Columbus, O.—15
Linde Air Products Co., New York, N. Y.
Manhattan Rubber Mfg. Co., Passaic, N. J.
Morris Machine Wks., Baldwinsville, N. Y.—174
New York Belting & Packing Co., New York, N. Y.
Quaker City Rubber Co., Philadelphia, Pa.
Republic Rubber Div., Youngstown, O.
Self-Vulcanizing Rubber Co., Inc., Chicago, Ill.
Sullivan Mchy. Co., Chicago, Ill.
Thermoid Rubber Co., Trenton, N. J.
United States Rubber Products, Inc., New York, N. Y.

HULLS (Dredge)

Chicago Bridge & Iron Co., Chicago, Ill. —121
Eagle Iron Works, Des Moines, Ia.—134
Manitowoc Eng. Wks., Manitowoc, Wis. —30

HYDRATORS

Arnold & Weigel, Inc., Woodville, O.
Blaw-Knox Co., Pittsburgh, Pa.—131
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Lime & Hydrate Plants Co., York, Pa.
McGann Mfg. Co., Inc., York, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

IDLERS (Conveyor)

Austin-Western Road Machy. Co., Aurora, Ill.—9
Bacon, Earle Co., Inc., New York, N. Y. —118
Barber Belt Co., Milwaukee, Wis.
Bartlett, C. O. & Snow Co., Cleveland, O. —167
Chain Belt Co., Milwaukee, Wis.
Diamond Iron Works, Inc., Minneapolis, Minn.
Fairbanks, Morse & Co., Chicago, Ill.
Fairfield Engineering Co., Marion, Ohio.
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Huron Industries, Inc., Alpena, Mich.—161
Jeffrey Mfg. Co., Columbus, O.—132
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Link-Belt Company, Chicago, Ill.—1
Parsons Engr. Corp., Cleveland, O.
Pioneer Engr. Wks., Inc., Minneapolis, Minn.—14
Portable Machy. Co., York, Pa.
Robins Conveying Belt Co., New York, N. Y.—159
Smidth, F. L. & Co., New York, N. Y. —Front Cover
Sprout, Waldron & Co., Inc., Muncy, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill. —124
Wood's, T. B., Sons Co., Chambersburg, Pa.

INDICATORS (Bin)

Bin-Dicator Co., Detroit, Mich.
Fuller Co., Catasauqua, Pa.—147

INSULATION (Electric)

General Electric Co., Schenectady, N. Y. —26, 27

INSULATORS, VIBRATION (Rubber)

Goodrich, B. F., Co., Akron, O.—3, 176

JIGS (Sand & Gravel)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Bendelari, F. N., Joplin, Mo.
Hardinge Co., Inc., York, Pa.—47
Traylor Engr. & Mfg. Co., Allentown, Pa. —7

KILN CHAIN SYSTEMS

Smidth, F. L. & Co., New York, N. Y.—Front Cover

KILN PARTS

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Atlas Car & Mfg. Co., Cleveland, O.
Birdsboro Steel Foundry & Mach. Co., Birdsboro, Pa.—45
Blaw-Knox Co., Pittsburgh, Pa.—131
Buchanan, C. G. Co., Inc., New York, N. Y.—45
Hardinge Co., Inc., York, Pa.—47
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Manitowoc Engr. Wks., Manitowoc, Wis. —30
Smidth, F. L. & Co., New York, N. Y.—Front Cover
Traylor Engr. & Mfg. Co., Allentown, Pa. —7

KILNS

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Blaw-Knox Co., Pittsburgh, Pa.—131
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.

KILNS (Rotary)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Bartlett, C. O. & Snow Co., Cleveland, O. —167
Blaw-Knox Co., Pittsburgh, Pa.—131
Chicago Bridge & Iron Co., Chicago, Ill. —121
Hardinge Co., Inc., York, Pa.—47
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Manitowoc Engr. Wks., Manitowoc, Wis. —30
McGann Mfg. Co., Inc., York, Pa.
Smidth, F. L., & Co., New York, N. Y.—Front Cover
Traylor Engineering & Mfg. Co., Allentown, Pa.—7
Vulcan Iron Works, Wilkes-Barre, Pa.

KILNS (Vertical)

Arnold & Son, Woodville, O.
Arnold & Weigel, Inc., Woodville, O.
Blaw-Knox Co., Pittsburgh, Pa.—131
Chicago Bridge & Iron Co., Chicago, Ill. —121
Hardinge Co., Inc., York, Pa.—47
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Vulcan Iron Works, Wilkes-Barre, Pa.

LABORATORY APPARATUS

American Instrument Co., Inc., Silver Springs, Md.
Bailey Meter Co., Cleveland, O.
Barnstead Still & Sterilizer Co., Inc., Boston, Mass.
Central Scientific Co., Chicago, Ill.
Denver Fire Clay Co., Denver, Colo.
Gallgher Co., Salt Lake City, U.
Humboldt Mfg. Co., Chicago, Ill.
Leeds & Northrup Co., Philadelphia, Pa.
Pyrometer Instrument Co., New York, N. Y.
Smidth, F. L., & Co., New York, N. Y.—Front Cover
Tagliabue, C. J., Mfg. Co., Brooklyn, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

LACING (Belt)

Detroit Belt Lacer Co., Detroit, Mich.
Flexible Steel Lacing Co., Chicago, Ill. —163

LADDERS (Dredge)

Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.—45
Buchanan, C. G., Co., Inc., New York, N. Y.—45
Eagle Iron Works, Des Moines, Ia.—134

LIGHTERS (Fuse)

Ensign-Bickford Co., Simsbury, Conn.—33

LIGHT PLANTS

Fairbanks, Morse & Co., Chicago, Ill.
Harnischfeger Corp., Milwaukee, Wis.—10
Novo Engine Co., Lansing, Mich.

LIME PLANTS

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
American Pulv. Co., St. Louis, Mo.—20
Arnold & Weigel, Inc., Woodville, O.
Blaw-Knox Co., Pittsburgh, Pa.—131
Chicago Bridge & Iron Co., Chicago, Ill. —121
Erie Steel Construction Co., Erie, Pa.
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Hardinge Co., Inc., York, Pa.—47
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Manitowoc Engr. Works, Manitowoc, Wis. —30
Smidth, F. L., & Co., New York, N. Y.—Front Cover
Traylor Engr. & Mfg. Co., Allentown, Pa. —7

LIME PUTTY PLANTS

Chicago Bridge & Iron Co., Chicago, Ill. —121
Potts, C. & G. Co., Indianapolis, Ind.—124

LINERS (Chute)

Advance Foundry Co., Dayton, O.
American Manganese Steel Co., Chicago Heights, Ill.—46
Bacon, Earle C., Inc., New York, N. Y. —118
Cincinnati Rubber Mfg. Co., Cincinnati, O.
Cross Engr. Co., Carbondale, Pa.—155
Goodrich, B. F., Co., Akron, O.—3, 176
Goodyear Tire & Rubber Co., Inc., Akron, O.—125
McLanahan & Stone Corp., Hollidaysburg, Pa.—28
Manganese Steel Forge Co., Inc., Philadelphia, Pa.
Manhattan Rubber Mfg. Co., Passaic, N. J.

LINERS, METAL (Kiln)

Atlas Car & Mfg. Co., Cleveland, O.
Hardinge Co., Inc., York, Pa.—47
Traylor Engr. & Mfg. Co., Allentown, Pa. —7

LINERS (Mill)

Advance Foundry Co., Dayton, O.
Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Babcock & Wilcox Co., New York, N. Y. —107
Carnegie-Illinois Steel Corp. (United States Steel Corp. Subsidiary) Pittsburgh, Pa.—43
Goodrich, B. F., Co., Akron, O.—3, 176
Hardinge Co., Inc., York, Pa.—47
Jeffrey Mfg. Co., The, Columbus, O.—132
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Manhattan Rubber Mfg. Co., Passaic, N. J.
National Malleable & Steel Casting Co., Cleveland, O.
Smidth, F. L., Co., New York, N. Y.—Front Cover
Traylor Engr. & Mfg. Co., Allentown, Pa. —7
United States Rubber Products, Inc., New York, N. Y.

LOADERS

Barber-Greene Co., Aurora, Ill.
Besser Mfg. Co., Alpena, Mich.—111
Bucyrus-Erie Co., South Milwaukee, Wis. —Outside Back Cover
Chain Belt Co., Milwaukee, Wis.
Fairfield Engr. Co., Marion, O.
Fuller Co., Catasauqua, Pa.—147
Gardner-Denver Co., Quincy, Ill.
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Haiss, Geo., Mfg. Co., Inc., New York, N. Y.—123
Jeffrey Mfg. Co., The, Columbus, O.—132
Link-Belt Co., Chicago, Ill.—1
Marion Steam Shovel Co., Marion, O.
New Holland Machine Co., New Holland, Pa.—167
Northwest Engr. Co., Chicago, Ill.—41
Osgood Company, Marion, O.
Portable Machy. Co., York, Pa
Robins Conveying Belt Co., New York, N. Y.—159
Ross Screen & Feeder Co., New York, N. Y.—130
Stearns Mfg. Co., Adrian, Mich.—108
Stephens-Adamson Mfg. Co., Aurora, Ill. —124
Sullivan Machy. Co., Chicago, Ill.
Universal Road Machy. Co., Kingston, N. Y.—16, 17
Wellman Engr. Co. (G. H. Williams), Cleveland, O.

LOADERS (Boat)

Link-Belt Co., Chicago, Ill.—1
Stephens-Adamson Mfg. Co., Aurora, Ill. —124

LOADERS (Box Car)

Barber-Greene Co., Aurora, Ill.
Chain Belt Co., Milwaukee, Wis.
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163

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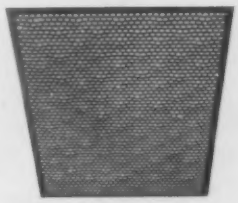

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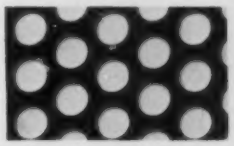

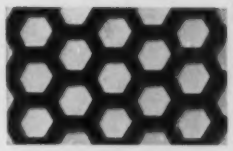

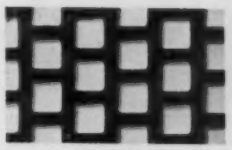

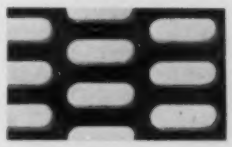

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Sales representatives in principal cities

DIRECTORY OF MANUFACTURERS' PRODUCTS—*Continued*

Jeffrey Mfg. Co., The, Columbus, O.—132
Link-Belt Co., Chicago, Ill.—1
Manierre Engr. & Machy. Co., Milwaukee, Wis.
Portable Machinery Co., York, Pa.
Richardson Scale Co., Clifton, N. J.—149
Stephens-Adamson Mfg. Co., Aurora, Ill. —124

LOADERS (Underground)

Bay City Shovels, Inc., Bay City, Mich.—144
Jeffrey Mfg. Co., The, Columbus, O.—132
Nordberg Mfg. Co., Milwaukee, Wis.—151
Thew Shovel Co., Lorain, O.—19

LOCOMOTIVES (Diesel-Electric)

Baldwin Locomotive Works, The, Philadelphia, Pa.
Davenport-Besler Corp., Davenport, Ia.—161
Fate-Root-Heath Co., Plymouth, O.—42
Heisler Locomotive Works, Erie, Pa.
Mid-West Locomotive Works, Cincinnati, O.
Plymouth Locomotive Works, Plymouth, O.—42
Vulcan Iron Works, Wilkes-Barre, Pa.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

LOCOMOTIVES (Diesel)

Baldwin Locomotive Wks., The, Philadelphia, Pa.
Brookville Locomotive Co., Brookville, Pa.
Cooper-Bessemer Corp., The, Mt. Vernon, O.
Davenport-Besler Corp., Davenport, Ia.—161
Fate-Root-Heath Co., Plymouth, O.—42
Ingersoll-Rand Co., New York, N. Y.—21
Lima Locomotive Works, Inc., New York, N. Y.—153
Mid-West Locomotive Works, Cincinnati, O.
Plymouth Locomotive Works, Plymouth, O.—42
Vulcan Iron Works, Wilkes-Barre, Pa.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Electric)

Atlas Car & Mfg. Co., Cleveland, O.
Baldwin Locomotive Wks., The, Philadelphia, Pa.
Davenport-Besler Corp., Davenport, Ia.—161
General Electric Co., Schenectady, N. Y. —26, 27
Heisler Locomotive Wks., Erie, Pa.
Jeffrey Mfg. Co., The, Columbus, O.—132
Lima Locomotive Wks., Inc., New York, N. Y.—153
Mid-West Locomotive Works, Cincinnati, O.
Vulcan Iron Works, Wilkes-Barre, Pa.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Whitcomb Locomotive Wks., Rochelle, Ill.

LOCOMOTIVES (Gasoline)

Baldwin Locomotive Wks., The, Philadelphia, Pa.
Brookville Locomotive Co., Brookville, Pa.
Davenport-Besler Corp., Davenport, Ia.—161
Fate-Root-Heath Co., Plymouth, O.—42
Heisler Locomotive Works, Erie, Pa.
Lima Locomotive Works, Lima, O.—153
Mid-West Locomotive Works, Cincinnati, O.
Plymouth Locomotive Works, Plymouth, O.—42
Porter, H. K., Co., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Gasoline-Electric)

Atlas Car & Mfg. Co., Cleveland, O.
Baldwin Locomotive Works, The, Philadelphia, Pa.
Davenport-Besler Corp., Davenport, Ia.—161
Fate-Root-Heath Co., Plymouth, O.—42
Lima Locomotive Works, Lima, O.—153
Mid-West Locomotive Works, Cincinnati, O.
Plymouth Locomotive Works, Plymouth, O.—42
Porter, H. K., Co., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Geared)

Heisler Locomotive Works, Erie, Pa.
Lima Locomotive Works, Inc., Lima, O.—153
Vulcan Iron Works, Wilkes-Barre, Pa.

LOCOMOTIVES (Kerosene)

Baldwin Locomotive Wks., The, Philadelphia, Pa.
Brookville Locomotive Co., Brookville, Pa.
Lima Locomotive Wks., Inc., Lima, O.—153
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Oil)

Lima Locomotive Wks., Inc., Lima, O.—153
Vulcan Iron Works, Wilkes-Barre, Pa.

LOCOMOTIVES (Oil-Electric)

Atlas Car & Mfg. Co., Cleveland, O.
Baldwin Locomotive Wks., The, Philadelphia Pa.
Cooper-Bessemer Corp., The, Mt. Vernon, O.
Fate-Root-Heath Co., Plymouth, O.—42
General Electric Co., Schenectady, N. Y. —26, 27
Heisler Locomotive Wks., Erie, Pa.
Ingersoll-Rand Co., New York, N. Y.—21
Mid-West Locomotive Wks., Cincinnati, O.
Plymouth Locomotive Wks., Plymouth, O. —42
Porter, H. K., Co., Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Steam)

Baldwin Locomotive Wks., The, Philadelphia, Pa.
Davenport-Besler Corp., Davenport, Ia.—161
Heisler Locomotive Wks., Erie, Pa.
Lima Locomotive Wks., Inc., Lima, O.—153
Mid-West Locomotive Wks., Cincinnati, O.
Porter, H. K., Co., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

LOCOMOTIVES (Storage Battery)

Atlas Car & Mfg. Co., Cleveland, O.
Baldwin Locomotive Wks., The, Philadelphia, Pa.
General Electric Co., Schenectady, N. Y. —26, 27
Jeffrey Mfg. Co., The, Columbus, O.—132
Vulcan Iron Works, Wilkes-Barre, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Whitcomb Locomotive Co., Rochelle, Ill.

LUBRICANTS

Alemite Corp., Chicago, Ill.
American Steele & Wire Co. (U. S. Steel Corp. Subsidiary,), Cleveland, O.
Bacon, Earle C., Inc., New York, N. Y.—118
Chicago Pneumatic Tool Co., New York, N. Y.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Gulf Refining Co., Pittsburgh, Pa.—130
Macwhyte Co., Kenosha, Wis.—11
Penola Inc., Pittsburgh, Pa.
Robins Conveying Belt Co., New York, N. Y.—159
Socony-Vacuum Oil Co., Inc., New York, N. Y.
Standard Oil Co. (Ind.), Chicago, Ill.
The Texas Co., New York, N. Y.—4

LUBRICANTS (Wire Rope)

American Steel & Wire Co. (U. S. Steel Subsidiary), Cleveland, O.
Broderick & Bascom Rope Co., St. Louis, Mo.—18
Macwhyte Co., Kenosha, Wis.—11
Roebling's, John A., Sons, Co., Trenton, N. J.—137
The Texas Co., New York, N. Y.—4

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Hercules Powder Co., Wilmington, Del.—13

MANGANESE STEEL PARTS

Alloy Cast Steel Co., Marion, O.
American Manganese Steel Co., Chicago Heights, Ill.—46
Bacon, Earle C., Inc., New York, N. Y.—118
Frog, Switch & Mfg. Co., Carlisle, Pa.
Manganese Steel Forge Co., Inc., Philadelphia, Pa.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.—39

MATERIAL HANDLING EQUIPMENT

Allen-Sherman-Hoff Co., Philadelphia, Pa. —Inside Front Cover
Arnold & Weigel, Inc., Woodville, O.
Austin-Western Road Machinery Co., The, Aurora, Ill.—9
Barber-Greene Co., Aurora, Ill.
Bartlett & Snow Co., Cleveland, O.—167
Chain Belt Co., Milwaukee, Wis.
Clyde Iron Wks., Inc., Duluth, Minn.
Diamond Iron Works, Inc., Minneapolis, Minn.
Fairfield Engr. Co., Marion, O.
Fuller Co., The, Catasauqua, Pa.—147
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Hardinge Co., Inc., York, Pa.—47
Harnischfeger Corp., Milwaukee, Wis.—10
Heltzel Steel Form & Iron Co., Warren, O.
Interstate Equipment Corp., Elizabeth, N. J.
Jeffrey Mfg. Co., The, Columbus, O.—132
Kennedy-Van Saun Engr. & Mfg. Corp., New York, N. Y.
Link-Belt Co., Chicago, Ill.—1
Northern Blower Co., Cleveland, O.
Raymond Pulv. Div., Chicago, Ill.—29
Robins Conveying Belt Co., New York, N. Y.—159
Sprout, Waldron & Co., Inc., Muncy, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill. —124
Syntron Co., Homer City, Pa.

MEASURING DEVICES

Bailey Meter Co., Cleveland, O.
Blaw-Knox Co., Pittsburgh, Pa.—131
Erie Steel Construction Co., Erie, Pa.
General Electric Co., Schenectady, N. Y. —26, 27
Hardinge Co., Inc., York, Pa.—47
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Richardson Scale Co., Clifton, N. J.—149
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

MECHANICAL RUBBER GOODS

Firestone Tire & Rubber Co., Akron, O.
Goodrich, B. F., Co., Akron, O.—3, 176
Manhattan Rubber Mfg. Div., The, Passaic, N. J.
Thermoid Rubber Co., Trenton, N. J.
Tyler Rubber Co., Andover, Mass.
United States Rubber Products, Inc., New York, N. Y.

MILL PARTS

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Blaw-Knox Co., Pittsburgh, Pa.—131
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Hardinge Co., Inc., York, Pa.—47
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
National Bearing Metals Corp., St. Louis, Mo.
Smidth, F. L., & Co., New York, N. Y.— Front Cover
Traylor Engr. & Mfg. Co., Allentown, Pa. —7

MILLS (Ball)
(See also Pulverizers)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
American Pulverizer Co., St. Louis, Mo. —20
Bartlett & Snow Co., Cleveland, O.—167
Bradley Pulverizer Co., Allentown, Pa.
Combustion Engr. Corp., Chicago, Ill.—29
Gallgher Co., Salt Lake City, Utah.
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Hardinge Co., Inc., York, Pa.—47
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Lewistown Foundry & Mach. Co., Lewistown, Pa.—167
Mills, Ellis, Mfg. Co., San Francisco, Calif.
Raymond Pulverizer Div., Chicago, Ill.—29
Smidth, F. L., & Co., New York, N. Y.— Front Cover
Straub Mfg. Co., Inc., Oakland, Calif.
Traylor Engr. & Mfg. Co., Allentown, Pa. —7
Vulcan Iron Works, Wilkes-Barre, Pa.
Williams Patent Crusher & Pulv. Co., St. Louis, Mo.—32

MILLS (Grinding)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
American Pulverizer Co., St. Louis, Mo. —20
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.—45
Bradley Pulverizer Co., Allentown, Pa.
Buchanan, C. G., Co., Inc., New York, N. Y.—45
Combustion Engr. Corp., Chicago, Ill.—29
Day Pulverizer Co., Inc., Knoxville, Tenn.
Dixie Machy. Mfg. Co., St. Louis, Mo.—120
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Hardinge Co., Inc., York, Pa.—47
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Knickerbocker Co., The, Jackson, Mich.
Pennsylvania Crusher Co., Philadelphia, Pa.—5
Raymond Pulverizer Div., Chicago, Ill.—29
Smidth, F. L., & Co., New York, N. Y.— Front Cover
Traylor Engr. & Mfg. Co., Allentown, Pa. —7
Williams Patent Crusher & Pulv. Co., St. Louis, Mo.—32

MILLS (Hammer)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Dixie Machy. Mfg. Co., St. Louis, Mo.—120
Gruendler Crusher & Pulv. Co., St. Louis, Mo.—163
Lime & Hydrate Plants Co., York, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.—5
Williams Patent Crusher & Pulv Co., St. Louis, Mo.—32

MILLS (Rod)

Allis-Chalmers Mfg. Co., Milwaukee, Wis. —129
Hardinge Co., Inc., York, Pa.—47
Jackson & Church Co., Saginaw, Mich.—114
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Traylor Engr. & Mfg. Co., Allentown, Pa. —7

MILLS (Roll)

Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.—45
Buchanan, C. G., & Co., New York, N. Y. —45
Combustion Engr. Corp., Chicago, Ill.—29
Hardinge Co., Inc., York, Pa.—47
Kennedy-Van Saun Mfg. & Engr. Co., New York, N. Y.
Raymond Pulv. Division, Chicago, Ill.—29
Sprout, Waldron & Co., Muncy, Pa.
Traylor Engr. & Mfg. Co., Allentown, Pa. —7
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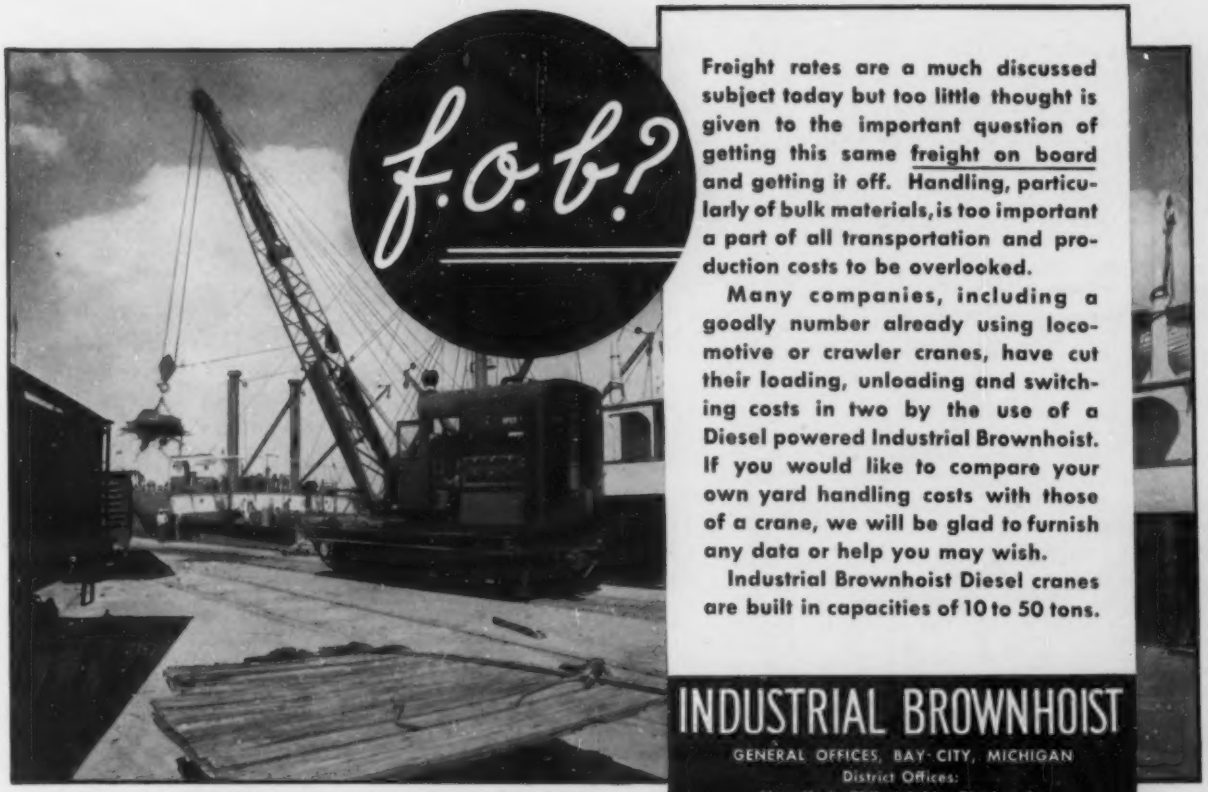
Kennedy-Van Saun Mfg. & Engr. Corp., New York, N. Y.
Lewistown Foundry & Mach Co., Lewistown, Pa.—167



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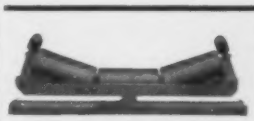

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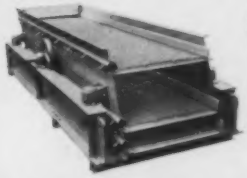

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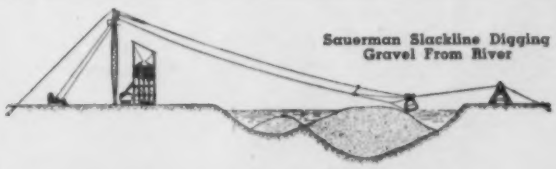

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Worthington Pump & Machy. Corp., Harrison, N. J.

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Dean Hill Pump Co. Anderson, Ind.
Fairbanks, Morse & Co. Chicago, Ill.
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Morris Machine Wks., Baldwinsville, N. Y.—174
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Worthington Pump & Machy. Corp., Harrison, N. J.

PUMPS (Diaphragm)

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Hardinge Co., Inc., York, Pa.—47
Jaeger Machine Co., Columbus, O.—15
Novo Engine Co., Lansing, Mich.
U. S. Rubber Products, Inc., New York, N. Y.

PUMPS (Dredging)

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Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.—45
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Lawrence Machine & Pump Corp., Lawrence, Mass.
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Pettibone Mulliken Corp., Chicago, Ill.—24

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Morris Machine Wks., Baldwinsville, N. Y.—174
Smidth, F. L., & Co., New York, N. Y.—Front Cover

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Bennett, W. H. K., Co., Chicago, Ill.
Climax Engr. Co., Chicago, Ill.
Ebel Hoist & Pump Co., Lansing, Mich.
Ellicott Machine Corp., Baltimore, Md.
Georgia Iron Works, Augusta, Ga.
Hetherington & Berner, Inc., Indianapolis, Ind.—165, 167
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Bethlehem Steel Co., Bethlehem, Pa.
Central Frog & Switch Co., Cincinnati, O.

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Atlas Car & Mfg. Co., Cleveland, O.
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General Equipment Co., Schenectady, N. Y.

RECTIFIERS

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Traylor Engr. & Mfg. Co., Allentown, Pa.—7

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Corhart Refractories Co., Louisville, Ky.
Denver Fire Clay Co., The, Denver, Colo.
General Refractories Co., Philadelphia, Pa.
Green, A. P., Fire Brick Co., Mexico, Mo.
Harbison-Walker Refractories Co., Pittsburgh, Pa.
Jaite Co., Jaite, O.
Johns-Manville, New York, N. Y.
Keasbey & Mattison Co., San Francisco, Calif.
Laclede-Christy Clay Products Co., St. Louis, Mo.
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Linde Air Products Co., New York, N. Y.
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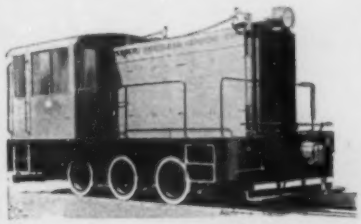

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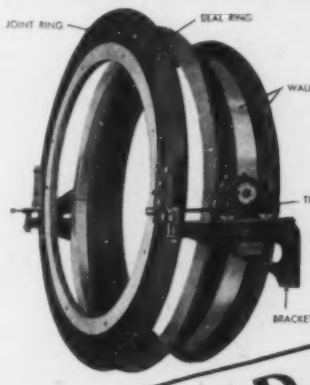

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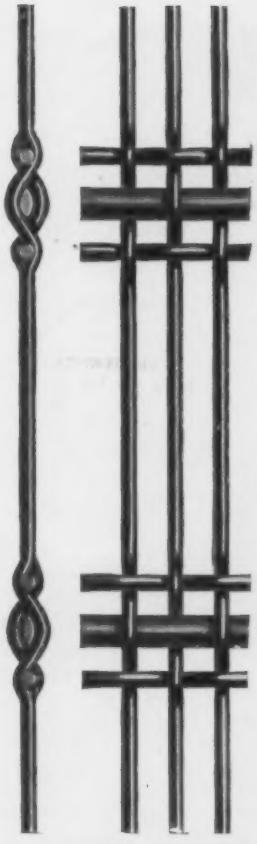

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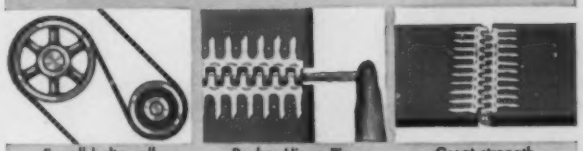

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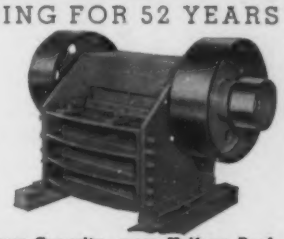

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Easton Car & Constr. Co., Easton, Pa.—135

TRUCKS (Gas-Electric)

Easton Car & Constr. Co., Easton, Pa.—135

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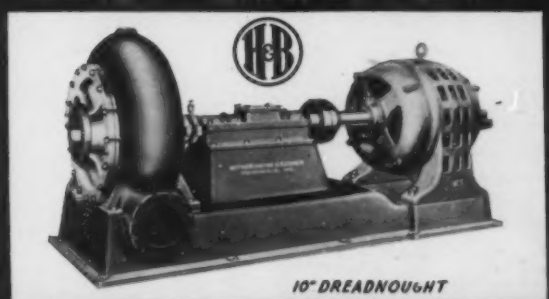

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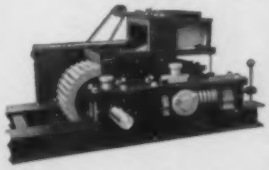

New Holland 1938 model Roll Crushers are equipped with manganese sectional shells that reduce the replacement cost 50%.

The new all roller bearing Pulsating Feeder doubles the roll capacity, prevents peaks in the load and excessive wear on the shells.

Write for 1938 Roll catalog.

NEW HOLLAND MACHINE COMPANY

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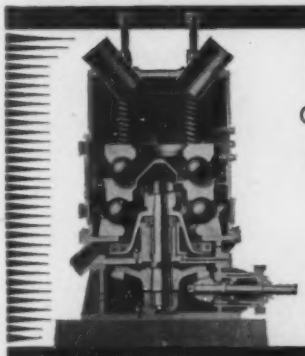

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Phosphate Rock

Limestone

Coal

Fuller-Kinyon Transport System for Pulverized Fuel.

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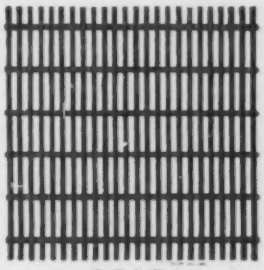

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CLEVELAND SCREENS are star performers—returning larger capacities, increased profits and more accurate separations at lower cost. Cleveland Screens save money with the initial investment because, if they are made of the longer-wearing, wear-resisting ALLOY NO. 2—Cleveland Screens stay on the job long after ordinary screens would have been replaced.

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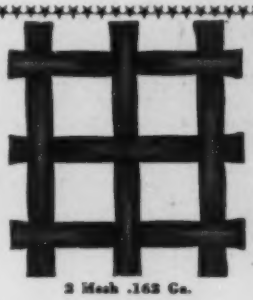

2 Mesh .162 Ga.

MORE PROFITS FOR YOU

DIRECTORY OF MANUFACTURERS' PRODUCTS—*Continued*

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Athey Truss Wheel Co. Chicago, Ill.

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Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wickwire-Spencer Steel Co., New York, N. Y.—173

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2—4′x8′ Allis-Chalmers Vib. Screens, 2-deck.
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1—"Jigger" Vib. Screen 2x5′, double deck.
12—Direct Heat Rotary Dryers; 4x20′, 4x30′, 5x30′, 5′6x40′, 5x60′, 6x40′, 6x60′, 7x60′, 8x60′, 8′8x85′.
4—Ruggles Coles Class "A" double shell Direct Heat Rotary Dryers; 5x26′, 5x30′, 6′8x40′, 8′8x85′.
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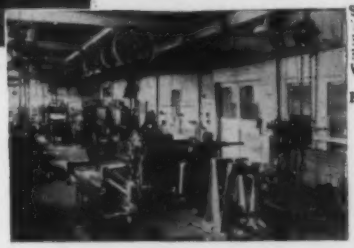
4—42″x16″ Allis Chalmers "B" Crushing Rolls.
1—20x14″ Sturtevant Crushing Rolls.
3—Raymond Roller Mills; 1—5 roll high side, 4—roll low side.
6—Raymond Pulverizers; No. 0000, No. 00, No. 1, No. 3.
7—Raymond Imp Mills; No. 3, No. 45, No. 50, No. 55.
6—Centrifugal Air Separators; 14′, 8′, 30″ Gayco, 10′ Sturtevant.
5—Hardinge Iron lined Ball Mills; 3′x8″, 6x16, 6x22, 6x30, 8x30.
2—2′x4′ Marcy Rod Mills.
1—No. 32 Marcy Ball Mill.
1—600 CFM. Air Compressor, I-R., with 100 H.P. 3/60/440 volt motor.
5—Single Roll Crushers; 18x16 Pennsylvania, 24x24 Link-Belt, 24x18 McLanahan.
2—36x36″ 4XB Gruendler Hammer Mill, also 4XA.
2—24″ Mikro Pulverizers, motor drive.
6—Oliver Filters; 3x1′, 3x2′, 6x4′, 6x6′, 6x10′, 8x9′.

Shops and Yards Cover 8 Acres of Ground



SEND FOR BULLETIN of our regular stock of Crushers; Vibrating Screens; Ball, Rod and Tube Mills; Air Compressors; Rotary Kilns and Dryers; Hardinge Ball and Pebble Mills; Raymond and other Pulverizers; Air Classifiers, Thickeners; Wet Classifiers; Filter Presses; Continuous Filters, etc.

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REDUC. TYPE: 6, 10 & 18″ Super. McCully fine reduc. 2′ Symons Cone, 7″ Newhouse & others.
ROLLS: Allis-C. 36x16, 40x15 & 54x24. Jeff. 30x30.
HAMMERMILLS: Williams Nos. 3, 4, 5 & 9.
MILLS: Kennedy Ball 4x6, 5x6 & 5x8. Kent 34x7″. 48″ Fuller-Lehigh. 5′x22′ Bonnot and others.

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CARS: 6 Yd. Koppel & 20 Yd. Western, Std. Ga. 14 Yd., 36″ Gauge Air Dump.
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CONVEYORS: 24″x25′, 57′ & 205′. 36″x194′. 60″ Unit. Also 30″x200′ Rubber Belt, Etc.
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DRAGLINES: Lorain Diesel, 55′ boom. Bucyrus 4 & 5 Yd. steam & Diesel-Elec., 115′.
DREDGES: 8, 10, 12 & 15″ Diesel & Elect. comp.
DRILLS: Ing.-Rand X-71 & D-10 and others. Sanderson Cyclone No. 14 & Loomis 6″ Well.
DRILL SHARPENERS: Leyner No. 50. Armstrong Well 6″.
ELEVATORS: 86′ c-c, 30x40″ buckets, 50 HP motor.
HOISTS: 100 & 150 HP Elect., single drum.
HYDRATING PLANT: No. 3 Clyde Hydrator, Etc.
KILNS: 8x110′ Rotary, 9/16″ plate. Others.
LOADERS: Barber-Greene No. 62 & other models.
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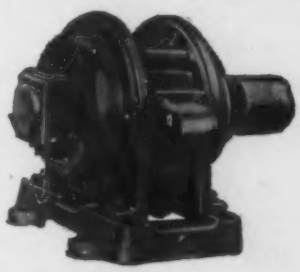

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Narrow Gauge Dump Cars and Locomotives
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1—15-20 ton Link-Belt. 50 ft. boom.
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18 in., 24 in., 30 in., and 36 in. Symons Disc.
4-10 TZ Traylor 4 ft. Gyratory.
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2000 ft. 36 in. used Belt.
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No. 0000 Raymond Mill & Separator.

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Crushers, 42" McC.—also 24x36 jaw.
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Complete gravel plant, central Illinois.
Crusher rolls, 16x42—pulverized, No. 4 Jumbo.
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NEW RAILS—5000 tons—All Sections—All Sizes.
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3—Lidgerwood, single friction drum quarry hoists, remote control, line-pull 5,000 lbs. at 400 f.p.m. Complete.

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20—2-ton steel dump cars and 1000 ft. of rail.

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4—12 yd. Western Std. Ga. Dump Cars.
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3—4 ton Vulcan 36" Ga. Locomotives.
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1—Type B-2 Erie Caterpillar Crane.
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Ladder dredge, 1000 tons per day capacity. Boiler new 1934, hull reconditioned 1934. Now operating.

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B-U-C-K-E-T-S

Clamshell—Owen ½, ⅝, 1¼, 1½ & 2 yd.; Kiesler ½, ⅝, ¾, 1, 1¼ & 1½ yd.; Blaw-Knox, Williams, Hayward, etc., ½ to 5 yd.; Brownhoist 1½ yd., like new.
Clamshell—Single Line & Electric, ¾ to 2 yd.
Orange Peel—Hayward, etc., 220 cu. in. to 5 yd.
Drag Scraper—Sauerman, etc., ½ to 5 yd.
Slackline—Sauerman, etc., ½ to 5 yd.
Dragline—Page, Omaha, NW & B-E, ½ to 8 yds.
Will appreciate your offers of used buckets.

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8—Stationary high pressure: 1—1100' Bury; 1—888' Ingersoll Rand, 19x12x16"; 1—527' Gardner Denver mod. ABH-1005; 1—513' Sullivan class WG6, 14x12"; 1—230' Gardner size 11x10"; 2—126' size 8x8" (1—Bury; 1—Chgo. Pneu.); 1—82' Gardner Denver, 5x4½".

35—Portable gas driven air compressors, 310, 220, 160, 110, 92 Ingersoll Rand, Chgo. Pneu. Tool, Gardner Denver, Schramm, Barnes, Domestic, Sullivan.

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2—3-compartment with scales, 8000 lbs. cap.; 1—150 ton Blaw Knox; 1—112 ton Butler.

9—2-compartment: 4—118 ton Blaw Knox; 1—87 ton Blaw Knox; 1—60 ton Butler; 2—35 ton Blaw Knox; 1—26 ton Heltzel. With or without weigh batchers.

1—1200 bbl. Blaw Knox round bulk cement bin with 2000 lbs. weigh batcher.

BUCKETS

1—4 yd. class G clamshell.

35—Williams, Blaw Knox & Owen clamshell—all sizes & types.

5—Page dragline: 2—1½ yd.; 2—1¼ yd.; 1—1 yd.

6—Dragscraper: 3—1 yd. Green & Cedar Rapids; 1—¾ yd. Sauerman; 2—½ yd. Green.

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Large lot including std. ga. 6 & 12 yd. and 20 yd., 36 ga. 5 yd. and 24 ga. 1½ yd. Also std. ga. flat cars and ballast cars.

CONVEYORS AND ELEVATORS

9—Port. belt conveyors with steel frame, gas or elec. pr. 18 & 24 in. Barber Greene.

11—Bucket elevators: 6—Chain Belt Co., Weller, & Link Belt vertical enclosed type—caps. from 35 to 117 TPH; 5—Weller inclined type, Nos. 3, 4, 5 & 6 up to 170 yds. per hr.

CRANES AND DRAGLINES

1—Link Belt K-55 ser. No. 1698, 70' boom, 2 yd. bucket; also have shovel attachment.

2—Northwest mod. 104, ser. Nos. 2079 & 1597, 45' boom, 1¼ yd. bucket; one with shovel attachment.

1—Northwest mod. 105, ser. No. 2053, 40' boom, 1 yd. bucket.

1—Link Belt mod. K-1, ser. No. 1024, 50' boom, 1 yd. bucket.

1—Osgood Heavy Duty, ser. No. 2069, 40' boom, 1 yd. bucket & with shovel attachment.

1—American Gopher GS-184, 50' boom, 1 yd. bucket.

1—Bucyrus-Erie, mod. 1030, ser. No. 10512, with ⅝ yd. shovel front.

1—Brownhoist No. 1 comb. shovel & crane No. 10057, 30' boom, ½ yd. shovel front.

1—Byers Bearcat crane, mod. 27, ser. No. 5289, half circle swing, ½ yd. bucket.

1—Erie type B-2, ser. No. 4122, steam crane, 40' boom, 1 yd. bucket.

CRANES (Locomotive)

2—Browning 25 ton cranes, ser. Nos. 1854 & 2060, 8 wheel, std. ga., 50' boom.

CRUSHERS

4—Gyratory: 1—Allis Chalmers size No. 6, style N; 1—Allis Chalmers Gates No. 5; 2—McCully No. 3.

2—Jaw Crushers: 1—12x26" Champion No. 6; 1—10x20" Climax No. 2½; 1—9x16" Telsmith No. 9-A.

1—Set of Allis Chalmers smooth type crushing rolls, size 42 x16".

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4—Steel stiff leg: 1—15 ton Dobbie, 100' boom; 1—15 ton Clyde, 50' boom; 1—15 ton Clyde "A" frame barge derrick, 50' boom; 1—10 ton Insley, 80' boom.

5—Steel guy derricks: 1—15 ton Terry, 100' boom; 1—10 ton American, 100' boom; 3—6 ton Bedford, 80' boom.

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2—Gardner Denver wagon or derrick drills with mod. 21 or 17 Gardner drills for channeling.

25—Ingersoll Rand & Sullivan jackhammer column & tripod drills.

1—Sullivan Diamond core drill, mod. 21, No. 3364.

1—Ingersoll Rand mod. 50 drill sharpener No. 6121.

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55—Electric, ranging from 20 HP to 125 HP, consisting of triple, double and single drum with A.C. or D.C. mtrs., some with attached swingers.

28—Gas hoists, ranging from 8 to 120 HP, single, double & triple drums; all standard makes.

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LOCOMOTIVES

32—Gas locomotives from 14-ton to 2-ton, std., 36" & 24" ga.

PUMPS

All sizes & types—force, centrifugal & steam.

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1—Mod. 75 Wiley Whirley No. 2973, 20 tons cap., 75' boom, SD Clyde 80 HP elec. hoist & 30 HP elec. swinger, all complete. Perfect condition.

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Belt Conveyors, 14"x60', 16"x64', 36x150'.
Robins Automatic Belt Trippers, 18 & 30".
Portable Belt Conveyor 16"x25', 3-hp.
Link-Belt Package Conveyor, 30"x30'.
Haiss Digging Loader, on Wheels.
Link-Belt Bucket Elevator, 10"x35' Encased.
Jeffrey Inclined Cont. Elevator, 14"x40'.
ELECTRIC PUMPS—1,000 gals. 50' head, 500 g. 300', 250 g. 156', 225 g. 105', 150 g. 150', 100 g. 105', 300 g. 35'.
Mundy 2-Drum 15-hp. Hoist, gas or elect.
Lidgerwood 1-Drum Rev. 7½-hp. Hoist, elec.
Steam Engine, Horizontal 12x12.
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2—Type A Jeffrey Hammer Mills, 24"x18".
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2—Deane Steam Pumps, 7⅛"x8½"x6", Serial Nos. 81900 and 82325.
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1—4x8 Traylor large size Sheridan Shaking Grizzley; never used.
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250 pulleys of various sizes and types for sale at bargain prices; diameter 6" to 128".

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No. 3 Northwest ¾ yd. Shovel & Dragline Comb.
310' Chicago Pneumatic Portable Air Compressor.
25, 30, 60, 100, 150, 200 HP up to 1250 HP Diesels.
20 and 30 Ton Steam Locomotive Cranes.
6" Jaeger self prime Cent. Pump, Hercules Engine.

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Overhauled—Immediate Shipment

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1—P & H 400 ¾ yd. Rebuilt gasoline comb. shovel and crane.
1—Byers 80 ¾ yd. gasoline crane New 1936.
1—Byers 125—1½ yd. gasoline Dragline New 1936.
1—Marion Electric Dragline Model 37, 50' boom, 1½ yd. bucket, excellent condition.
1—Marion 36 Steam shovel extra length boom and dipper sticks.
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1—37 Kennedy Van Saun gyratory crusher with V belt drive and motor.
1—8 inch McCulley gyratory crusher.
1—No. 3 Austin gyratory crusher.
1—Three Drum American Hoist.
1—22 Ton Steam Locomotive.
1—18x24 Crushing rolls.
1—Sauerman Slackline Elec. Hoist with 150 hp. motor.
1—12 inch Amsco dredge pump 250 hp. motor direct connected.
1—Set Link Belt dredging elevator—2-30 inch continuous buckets 36 ft. centers with extra parts for longer centers.
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1—Dorr washer with sand drags.
1—Air compressor.
1—65 ft. steel ladder for dredge boat.
1—60 ft. steel spud for dredge boat.
1—Rachet type Elec. spud hoist.
6—Transformers and various motors.

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ELECTRIC MOTORS

12— 75 HP— 875 RPM
2—100 HP— 875 RPM
2— 125 HP—3600 RPM
2—150 HP—1800 RPM
1—200 HP—1760 RPM
1—200 HP—1800 RPM
2—200 HP—1175 RPM
5—250 HP—1800 RPM

All 3 phase, 60 cycles,
440 Volts—General Electric

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Steam, Gasoline, Electric Shovels, ⅜-8 yd.
Steam, Gasoline and Electric Hoists
20-40 ton std. ga. Locomotive Cranes.
8x12 to 66x84" Jaw Crushers.
10" Superior McCully Gyratory Crusher.
No. 4-18 Allis Chalmers Gyratory Crushers.
No. 2 and 5½ Symons Cone Crushers.
5-20 ton Guy and Stiff Leg Derricks.
Locomotives, Steam, Gasoline, various gauges.
Buckets, Clamshell, ½-2 yd.—dragline ⅜-2 yd.
100 HP. Fairbanks, 125 HP. Venn Severin Diesels.
Others up to 750 HP. with and without generators.
Natural Gas and Steam Engines.
Special, Sullivan 400-600 CFM Air Compressor.
Sullivan Drill Sharpener, ⅞-1" tools.
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800' double cableway, two electric hoists.
20 ton capacity float, 10'x16'6" platform.
3x6' Simplex double deck screen.
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2—Steel, 29' dia. capacity 231 yds. each.
1—Blaw-Knox steel 2 compartments 72 tons.
1—Blaw-Knox steel 2 compartments 51 tons.
2—Fuller 155 bbls. Bulk cement-automatic batchers.

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COMPLETE plants 105 yds. to 1000 yds. capacity includes aggregate bins—bulk cement bins—mixers—conveyors—elevators, etc.
ALSO furnish individual items for plants.

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JAW—6x12, 9x15, 9x16, 18x36, 24x36.
GYRATORY—No. 5 McCully—No. 37 Kennedy-Van Saun.

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20" complete 110' centers.
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1 Elevator, buckets 8"x6"x12", centers 32'.
1 Portable 14"x20' electric A.C. belt.
1 Nelson Bucket Portable-caterpillar-gas.

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1 P&H Model 204—Crane ¾ yd.
1 P&H Model 400—Crane ¾ yd.
1 P&H Model 600—Crane and shovel 1¼ yd.
1 Lima 1½ yd. crane and shovel.
1 Northwest Model 105—¾ yd.
1 Osgood steam shovel 1¼ yd.
1 Browning Truck crane.

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4—36" gauge 20 tons—gas—Whitcomb and Vulcan.
1—36" gauge 14 tons—gas—Whitcomb.
1—36" gauge 4½ tons—gas—Vulcan.

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1—6" Gould, sand, belt drive.
1—8" AMSCO dredge Type M-150 HP motor drive.
15—Steam Horizontal Duplex—all sizes.

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JANUARY SPECIALS

9x36 Universal jaw crusher.
24x36 Farrell jaw crusher.
8" Superior-McCully reduction crusher.
24" Bonnot reduction crusher.
30x42 Pennsylvania hammermill.
50 h.p. gasoline engine with power unit.
75 h.p. gasoline engine with power unit.
125 h.p. gasoline engine with power unit.
25 h.p. oil engine.
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1½ yd. dragscraper outfit.
1 yd. Caterpillar outfit.
40' bucket elevator.
60' bucket elevator.
24"x100' belt conveyor .
24"x30' portable conveyor.

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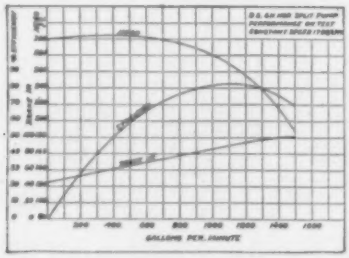

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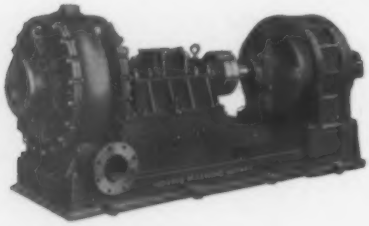

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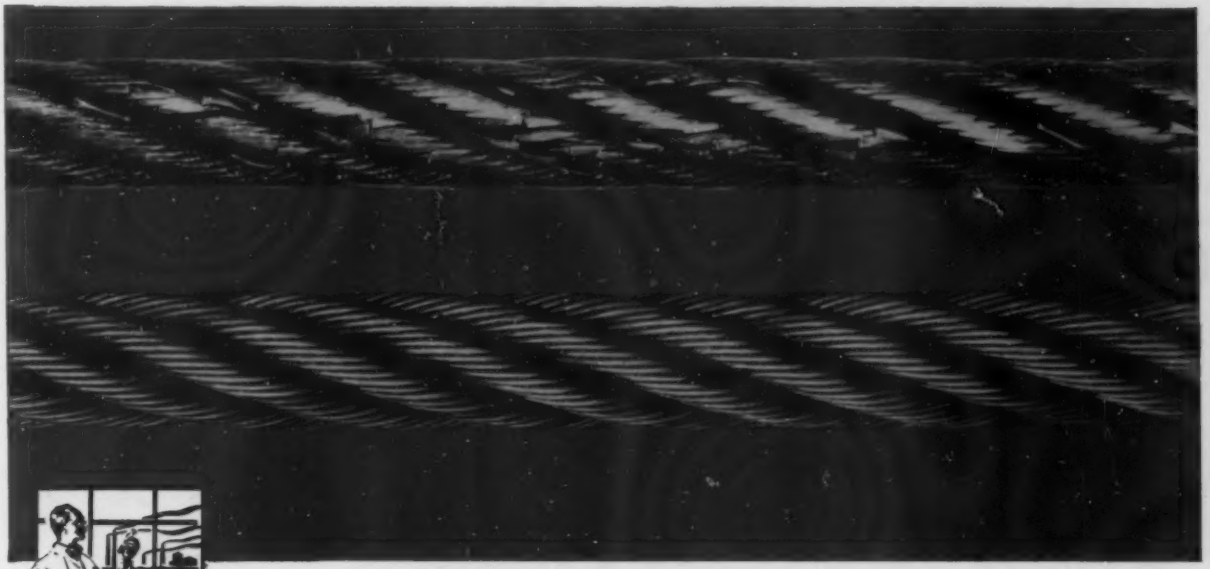

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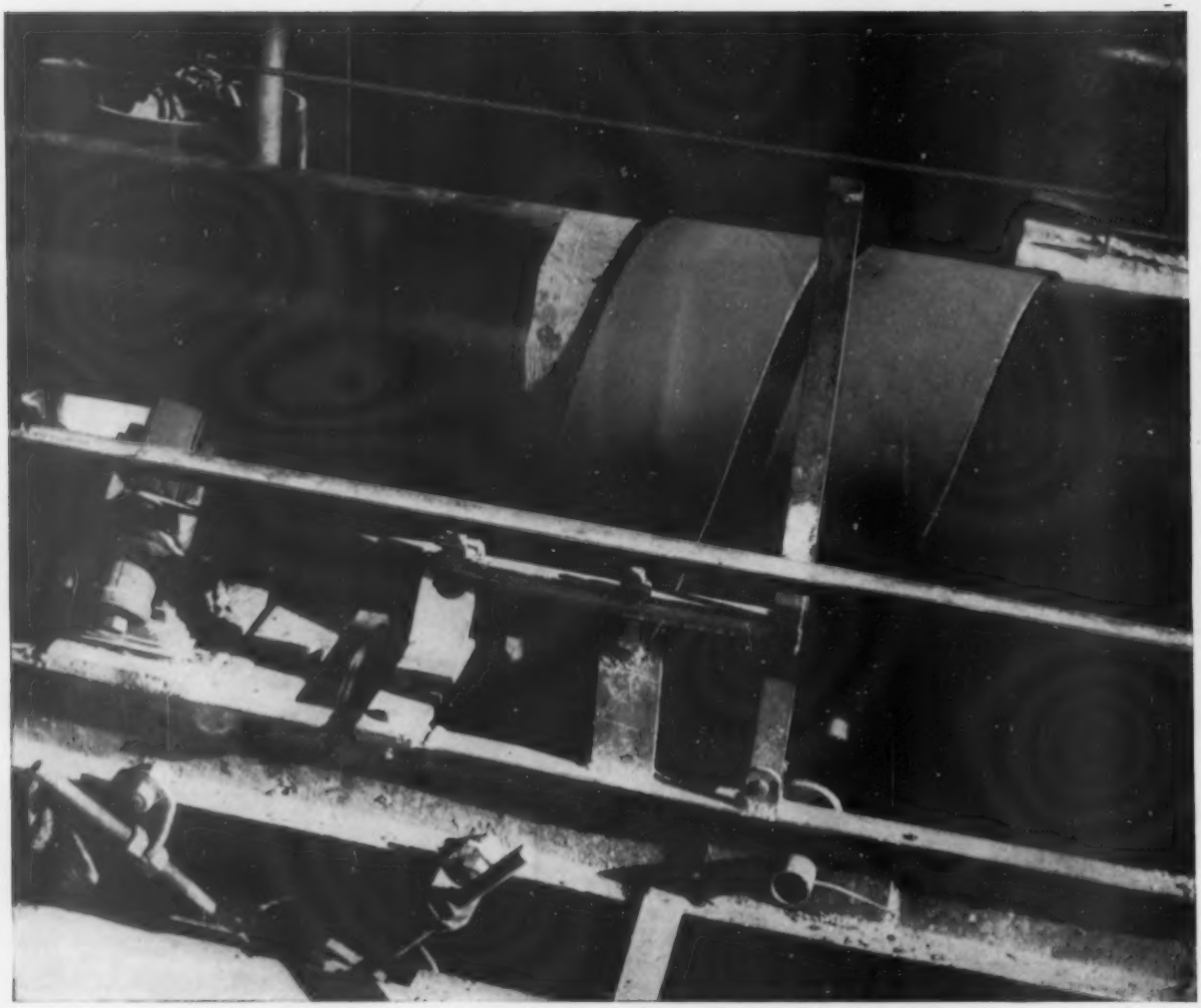

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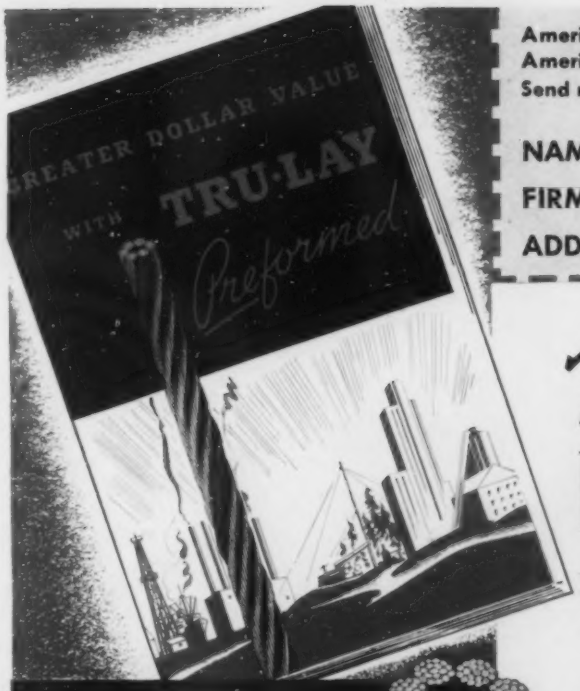

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